DISARMAMENT AND FOREIGN POLICY

UNIVERSITY
OF MICHIGAN

APR 6 1959

MAIN
READING ROOM

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON FOREIGN RELATIONS UNITED STATES SENATE

EIGHTY-SIXTH CONGRESS

FIRST SESSION

(PURSUANT TO S. RES. 31)

PART 1

JANUARY 28, 30, AND FEBRUARY 2, 1959
WASHINGTON, D.C.

Printed for the use of the Committee on Foreign Relations

UNITED STATES
GOVERNMENT PRINTING OFFICE
36042 WASHINGTON : 1959

COMMITTEE ON FOREIGN RELATIONS

J. W. FULBRIGHT, Arkansas, *Chairman*

THEODORE FRANCIS GREEN, Rhode Island
JOHN SPARKMAN, Alabama
HUBERT H. HUMPHREY, Minnesota
MIKE MANSFIELD, Montana
WAYNE MORSE, Oregon
RUSSELL B. LONG, Louisiana
JOHN F. KENNEDY, Massachusetts
ALBERT GORE, Tennessee
FRANK J. LAUSCHE, Ohio
FRANK CHURCH, Idaho

ALEXANDER WILEY, Wisconsin
BOURKE B. HICKENLOOPER, Iowa
WILLIAM LANGER, North Dakota
GEORGE D. AIKEN, Vermont
HOMER E. CAPEHART, Indiana
FRANK CARLSON, Kansas

CARL MARCY, *Chief of Staff*
DARRELL ST. CLAIRE, *Clerk*

SUBCOMMITTEE ON DISARMAMENT

HUBERT H. HUMPHREY, *Minnesota, Chairman*

RUSSELL B. LONG, Louisiana
JOHN F. KENNEDY, Massachusetts

ALEXANDER WILEY, Wisconsin
BOURKE B. HICKENLOOPER, Iowa
WILLIAM LANGER, North Dakota

CARL MARCY, *Chief of Staff*
BETTY GOETZ, *Staff Director*

NOTE.—Sections of this hearing have been deleted in the interest of national security. Deleted material is indicated by the notation "[deleted]."

DEPOSITED BY THE
UNITED STATES OF AMERICA

PREFACE

(By Senator Hubert H. Humphrey)

The Senate Foreign Relations Subcommittee on Disarmament held a series of hearings during January and February 1959. The title of the hearings, the transcript of which appears on the following pages, is "Disarmament and Foreign Policy." This title reflects the subject matter of the hearings which covers a variety of problems all of which deal with the relationship of armaments control with other matters of foreign policy.

After many months of study it has become apparent that the problems of disarmament are an integral part of general foreign policy and they cannot be considered and dealt with in a vacuum outside of related foreign policy considerations. The study of disarmament also is connected to questions of defense strategy and defense capabilities and the hearings reveal the extent to which these matters must be coordinated and linked with disarmament policy.

The hearings do not provide definitive answers to the many questions raised but they do contain a wealth of information regarding many of the current aspects of U.S. arms control policy.

MARCH 12, 1959.

CONTENTS

	Page
Preface	III
Statement of—	
Bethe, Dr. Hans, member, President's Science Advisory Committee and professor of physics at Cornell University	166
Burke, Adm. Arleigh A., Chief of Naval Operations, U.S. Navy	77
Farley, Philip, Special Assistant to the Secretary of State for Disarmament and Atomic Energy	33
Fisk, Dr. James, member of the President's Science Advisory Committee, and Chairman of the Western Delegation at the Geneva Conference of Experts to Study the Methods of Detecting Violations of a Possible Agreement on the Suspension of Nuclear Tests	2
Foster, William C., chairman and senior U.S. expert at the Conference of Experts for the Study of Possible Measures Which Might Be Helpful in Preventing Surprise Attack	53
Murphy, Mr. Leonard, Chief of the Seismology Branch of the U.S. Coast and Geodetic Survey	20
Romney, Dr. Carl, seismologist with the Air Force	6
Taylor, Gen. Maxwell D., Chief of Staff, U.S. Army	115
White, Gen. Thomas D., Chief of Staff, U.S. Air Force	120
Statement submitted for the record by—	
Press, Dr. Frank, director, seismological laboratory, California Institute of Technology	51
APPENDIX	
Report of the Conference of Experts to Study the Methods of Detecting Violations of a Possible Agreement on the Suspension of Nuclear Tests	187

DISARMAMENT AND FOREIGN POLICY

WEDNESDAY, JANUARY 28, 1959

U.S. SENATE,
SUBCOMMITTEE ON DISARMAMENT OF THE
COMMITTEE ON FOREIGN RELATIONS,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:05 a.m., in the committee room, U.S. Capitol Building, Senator Hubert H. Humphrey (chairman of the subcommittee) presiding.

Present: Senators Humphrey, Wiley, and Hickenlooper of the subcommittee and Senator Gore.

Also present: Dr. Dean S. Carder, Chief Seismologist, Coast and Geodetic Survey; Ronald I. Spiers, Officer in Charge of Disarmament Affairs, Department of State.

OPENING REMARKS OF THE CHAIRMAN

Senator HUMPHREY. This is an executive session. However, after consultation with the witnesses for purposes of determining what material should be deleted, the transcript will be published.

Today's hearing is the first of a series being held by this Subcommittee on Disarmament. The object of this particular hearing is to review the present negotiations now underway in Geneva regarding an international agreement on the suspension of nuclear weapons tests.

We also plan to discuss today the significance of new scientific data which bears on the feasibility and effectiveness of the control system for a ban on nuclear tests, and finally, we want to discuss U.S. policy with respect to other arms control measures.

Now, I have suggested that the procedure for today's hearing be as follows:

Dr. James Fisk, chairman of the Western delegation of the Geneva Technical Conference, last summer, will outline briefly the conclusions of the Geneva Technical Conference with emphasis on the control system for seismic events, that is, underground explosions as well as earthquakes.

Dr. Carl Romney, seismologist with the Air Force and chairman of a panel of scientists which evaluated seismological data from the recent U.S. series of nuclear tests, will present the findings from the Hardtack series of underground explosions which took place October 1958.

I have also asked the head of the seismology branch of the U.S. Coast and Geodetic Survey, Mr. Leonard Murphy, to present the Survey's analysis of the Hardtack series.

Dr. Fisk, with comments also from Dr. Romney and Mr. Murphy, will present what improvements might be rendered in the control system to make its effectiveness at least as good as that agreed upon at the Geneva Technical Conference.

Finally, Mr. Philip Farley, Special Assistant to the Secretary of State for Disarmament and Atomic Energy, will present an account of the current negotiations for a test ban.

Dr. Fisk, our first witness, as I mentioned, was the chairman of the Western Delegation to the Geneva Conference of Experts To Study Methods of Detecting Violations of a Possible Agreement of the Suspension of Nuclear Tests. He is currently a member of the President's Science Advisory Committee, and has also served on the Atomic Energy Commission's General Advisory Committee.

Dr. Fisk, please proceed.

Dr. FISK. Very good, Senator Humphrey.

Senator HUMPHREY. Thank you very much for your cooperation.

Dr. FISK. Thank you. I am glad to be here, sir.

STATEMENT OF DR. JAMES FISK, MEMBER OF THE PRESIDENT'S SCIENCE ADVISORY COMMITTEE, AND CHAIRMAN OF THE WESTERN DELEGATION AT THE GENEVA CONFERENCE

Dr. FISK. I thought perhaps the best way to meet with your intent, Senator, would be to talk directly from the report which was issued following the conclusion of the Conference in Geneva this summer.[1]

In this report, on page 3, is noted that a basic difficulty in detecting and identifying small explosions arises because of many natural phenomena, earthquakes, thunderstorms, and others which give signals similar to those produced by explosion, or which by their presence hinder detection of the signal sought. And following that we observed the discrimination of the signals of natural events from signals of explosions is aided by a careful analysis of data taking into account readings obtained at several points, and those unidentified, still unidentified, might be resolved by inspection.

GENEVA CONCLUSIONS ON DETECTION OF UNDERGROUND EXPLOSIONS

These two paragraphs, I think, are really the heart of the proper introduction to the present subjects of interest today.

Now, farther along in this report we discuss the conclusions as to the applicability of seismic methods of detecting underground events. I will pass over the other techniques and methods; I believe they are not now a matter of debate.

In this section on the seismic technique, which we debated at length before discussing the system as a whole, there are several points that are worth noting. Item 2 in that section refers to the Rainier shot which was a principal, but not the only source of information available to us and it reads this way: longitudinal seismic waves caused by underground nuclear explosions set off under conditions analogous to which the Rainier shot was caused can be detected, and the first motion of the longitudinal wave can be determined at a distance of approximately 1,000 kilometers, and also at distances of 2,000 and 3,500 under certain conditions, and one of those conditions is that the site be considerably more quiet than the average for explosions of the

[1] The text of the report of the Geneva Conference of Experts is given in the appendix to this day's testimony, starting at p. 187.

order of 5 kilotons recorded during periods of unfavorable noise conditions.

Then it notes certain other matters that have a relevance to the system later on.

I cite this paragraph because this is the first point at which the 5 kiloton number is introduced, I believe.

Later in the same section, in paragraph 5, there is this rather important statement:

> The majority of earthquakes can be distinguished from explosions with a high degree of reliability if the direction of first motion of the longitudinal wave is clearly registered at five or more seismic stations on various bearings from the epicenter—

and then—

> Thus not less than 90 percent of all earthquakes taking place in continents can be identified.

Once again this statement has to do with the technique, so far, and not with the numbers of stations or the system as a system.

There is also a final note in that section that observes that the range and accuracy of recording and identifying underground nuclear explosions can be improved in the future by certain methods and techniques.

I would like to turn then to a consideration of the system, as such, that is, the way in which the various techniques and methods were assembled to provide the system for observing possible violations of test cessation.

On page 21 we take some pains to point out the important parameters which characterize a system for this purpose, and these points are made: That a network of control posts is characterized by three main parameters; (*a*) the minimum yield adopted for the nuclear explosion or the natural events giving equivalent signals; (*b*) the number of control posts, and (*c*) the probability of correct identification of natural events, particularly earthquakes.

DETECTION OF LARGE EXPLOSIONS RELATIVELY EASY

Now, the point here is perhaps quite obvious. It is perfectly clear that if one goes to very high yield explosions the procedures and techniques are fairly straightforward.

Senator WILEY. Are what?

Dr. FISK. Are fairly straightforward, and the problem is relatively easy.

Senator WILEY. Are you arriving at the point which has been discussed so much in the press lately, that whereas previously we thought we could detect any nuclear explosion, we now believe that we cannot?

Dr. FISK. Well, sir, I was not quite to that point, I was trying to describe the background.

Senator HUMPHREY. He was describing the system necessary to detect tests.

Dr. FISK. The background, the system that was agreed upon this summer, and it seemed to me in response to Senator Humphrey's request that this could provide a background on which we could then examine the new data and its implications.

Senator HUMPHREY. Dr. Fisk is now describing to us the system and the methods which were agreed upon at the Geneva Technical Conference and in relation to that system he will discuss the new data. He will evaluate the meaning of that new data in reference to the agreed upon control system.

Is that right?

Dr. FISK. Yes, sir. I presume Dr. Romney will give the principal part of the new data.

Senator HUMPHREY. Yes, sir; but you are presenting the background for the new data.

Dr. FISK. Yes, sir.

Senator WILEY. My question was whether or not we can detect underground nuclear tests; who is right in this controversy?

Senator HUMPHREY. We are going to get to that. Our plan of procedure was to let the scientists discuss first the control system agreed upon at the Geneva Conference of Experts, so that we can be somewhat informed on that, and then discuss the new data and its relevance to the decisions of the Conference this last summer.

I do not think we should expect right at this time a quick yes or no, because many factors are involved. I believe I am correct in that.

Senator WILEY. I am asking the question because I want a direct answer if Dr. Fisk can give it to me. Are we in position now to detect all of the explosions that the Kremlin might conduct? There has been a great deal of controversy in the press on this issue.

Dr. FISK. May I attempt a fairly lengthy answer to your question, Senator?

SUMMARY OF SIGNIFICANCE OF NEW DATA

The area of discussion is very broad here. I would like to confine my own comments to the specific technical problem of our ability to detect and identify underground explosions. This is the most difficult, I believe, area at the present time, and it is the area that has been disturbed by the findings in the tests that were conducted last October.

Now we had concluded last summer, and stated in our report, that tests of 5 kilotons, conducted underground, could be detected with a very high probability and that about 90 percent of seismic events of this yield equivalent could be definitely identified as earthquakes.

The newest data in the Nevada tests last fall show that there are about twice as many earthquakes of about that equivalent size as we had thought. Mr. Romney will confirm this or correct me.

It also turns out that the actual signal, the actual earth disturbance which you measure on a seismograph, which is produced by a small underground explosion of a few kilotons, is somewhat less, I believe, about 60 percent or two-thirds of that that we had assumed on the basis of earlier information.

Taking these 2 things together, the problem of identification is more difficult than we had thought, and therefore, if the system that is described in this report were adopted without any modification whatsoever, the requirement on onsite inspection by people would be about 10 times as great as we had anticipated.

This is the import of the new data, I believe. Or to state it another way: Instead of having a limit of 5 kilotons below which the probability of identification would decrease rapidly, the limit is more nearly 15 or 20 kilotons.

METHODS OF IMPROVING THE SYSTEM

Now, this is the status following the new data from the fall series of tests. Meanwhile, a careful look has been going on at the ways in which the present system described in this report could be improved with known techniques, available technology and science, to restore the capability of the system to the capability which was stated in this report, and I can say that these new or modified methods, methods of analysis, instrumental methods, and the use of more techniques than the one we had principal reliance on, that these new things give real promise of restoring the system to the capability which was stated in this report.

This is a very lengthy answer. It is very hard to give a "yes" or "no" answer to your question.

Senator WILEY. I think you have given me the information in which I was interested. I have another question.

GENEVA CONCLUSIONS PROVIDED FOR IMPROVEMENTS IN DETECTION SYSTEM

In the Geneva Conference did you arrive with the Soviet representatives at any definitive arrangement limiting our right in any way to to improve our detection system?

Dr. FISK. No, sir. On the contrary, we, all of us, recognized there, and it is stated in more than one place in this report, that it is only to be expected that improvements would follow with the sort of scientific research and development that would be normal in a field like this.

I quoted this sentence, this is part of the report:

> It is noted that the range and accuracy of recording and identifying underground nuclear explosions can be improved in the future by means of perfecting the methods of recording seismic waves, both by way of perfecting apparatus and also by way of perfecting the methods for differentiating earthquakes from explosions.

That was a statement that we all believed, and I think that is the kind of statement that one would make in almost any field of scientific and technical activity.

Senator HUMPHREY. In other words, you did not foreclose the possibility for advancement and improvement. In fact, you endorsed the possibility and the necessity of improvements.

Dr. FISK. Yes, sir; and there is another statement somewhat further on, perhaps I should not hunt for it at the moment, but one of our final statements in the report bears exactly on that and points up the importance of and the value of continued study and research of this problem, not only at improving the system, but in obtaining very important information about the geophysic and other natural scientific matters.

Senator WILEY. Thank you, Mr. Chairman.

Senator HUMPHREY. Proceed, Doctor.

Dr. FISK. I don't want to hold the floor, sir, but I would like to ask my colleague who was with me all summer, Dr. Romney, if he would concur in the statement that I just made in answer to Senator Wiley's question. He may feel that my answer to this question

should be modified in one way or another, and he is very expert in this field.

Senator HUMPHREY. Dr. Romney.

STATEMENT OF DR. CARL ROMNEY, SEISMOLOGIST WITH THE AIR FORCE

Dr. ROMNEY. I agree in general with what he has said. There might be one or two specific details that I think could bear further elaboration, but Dr. Fisk is certainly correct, the door is not closed for improvements, and the methods by which one would proceed to detect small shots are quite clear. Whether we could get the Russians to agree is a question we cannot answer.

Senator WILEY. Was the Conference equally harmonious with the Soviets in every respect?

Dr. FISK. No, sir. We managed to work with them and we managed to reach agreements, but it was not a restful and relaxing summer, I can assure you.

Senator HUMPHREY. Dr. Fisk, are you saying that at the time of the technical discussions in Geneva this past summer, the conclusions were that the agreed upon detection system had a reliability of a little over 90 percent for detection of seismic events of 5 kilotons or over?

Dr. FISK. We were talking in round numbers of 90 percent or thereabouts.

Senator HUMPHREY. That is right. But with the new data and new improvement in the detection system, the events that would be detectable 90 percent of the time would be between 15 and 20 kilotons?

Dr. FISK. On the same basis.

Senator HUMPHREY. With the same system that is agreed upon in this particular report that we have.

Dr. FISK. I believe that is the judgment of the people that have examined it most closely, that it would be of the order of 20 kilotons.

Senator HUMPHREY. In other words, the new data reveals that it is more difficult to distinguish between explosions of a nuclear character and earthquakes, is that correct?

Dr. FISK. Yes, sir.

Senator HUMPHREY. Then do I understand that you have indicated that despite this new data, this does not foreclose the possibility of improvement of detection systems which would make it possible to return to the original estimates of close to a 90 percent reliability?

IMPROVEMENTS CONSIDERED

Dr. FISK. There appear to be a number of promising techniques that involve methods of analysis, methods by which the actual signal registered by a seismograph could be increased, methods of reducing the noise which is the thing that disturbs the signal and causes confusion, and the use of other phenomena than the one on which we focused primary attention, the most promising being what is known as surface waves created by earthquakes or nuclear explosions.

Senator HUMPHREY. Yes.

Dr. FISK. Now, there is more than one aspect of each of these categories that I have mentioned. They are all being studied, I understand, quite carefully right now, and I would think in my

experience in technical matters of this sort that improvements sufficient to restore the capabilities stated in the report are quite likely.

Senator WILEY. Do I understand that 90 percent of nuclear explosions could be identified; the other 10 percent could be detected, but it would not be possible to say definitely that they were nuclear. They would be something else?

Dr. FISK. They might or might not be; you would be unsure.

Senator WILEY. Yes, that is what I mean. You detect 100 percent of the explosions, though, is that right?

Dr. FISK. Yes.

Senator HUMPHREY. The identity of 10 percent would be in doubt.

Dr. FISK. Ten percent in doubt.

Senator GORE. Instead of saying 100 percent of explosions, do you not really mean that you will detect 100 percent of the earth movements?

Dr. FISK. That is right, sir.

Senator GORE. And as of last summer the scientists concluded that they will be unable to distinguish nuclear explosions from natural earth movements, earthquakes, in approximately 10 percent of the cases?

Dr. FISK. Yes, sir; that was the conclusion. It is the identification problem that is the difficult one, in the underground cases.

Senator HUMPHREY. And it is the identification problem to which the new effort is being applied as a result of the new data, is that correct?

Dr. FISK. Yes, sir.

TECHNICAL CONFERENCE RECOMMENDED 180 STATIONS WORLDWIDE

Senator GORE. May I ask a question?

Senator HUMPHREY. Please, go right ahead, Senator.

Senator GORE. The experts representing the three countries finally recommended the establishment of 180 stations?

Dr. FISK. Are you referring to the present negotiations, Senator?

Senator GORE. No, I was referring to the scientific conference of last year.

Dr. FISK. The confusion was that there are eight countries or two delegations, I just wanted to make clear.

Yes, we did agree in both delegations jointly as a scientific meeting on this system which involves 180 stations.

Senator GORE. And those 180 stations were worldwide installations?

Dr. FISK. Yes, sir.

Senator GORE. With some increased number in the seismic areas?

Dr. FISK. That is correct.

Senator GORE. This included how many stations in the Soviet Union?

Dr. FISK. In the Soviet Union proper, I would have to refer to Mr. Romney. The numbers we marked down were 37 in Asia, 6 in Europe. I guess that that would mean something like 25 in Russia proper, 20 to 25 in Russia proper.

Senator GORE. How many in China?

Dr. FISK. I don't have it broken down.

Senator GORE. I think it was 5 out of 25.

Dr. FISK. I beg your pardon?

Senator GORE. I believe your recollection may be a little high on the number in Russia.

Dr. FISK. It may be high; I don't have it broken down. We were doing our very best to avoid political arguments and national arguments in this situation, so we did not consider national boundaries in coming to numbers of this kind, rather continental areas, and things of that sort.

Senator GORE. 37, you say, in Asia.

Dr. FISK. 37 in Asia, 7 in Australia, 16 in South America, and so on; 24 in North America.

PROBLEM OF STATIONS IN COMMUNIST CHINA

Senator GORE. Would you think this system would be adequate if we had 37 in Asia and only 20 were agreed to be installed?

Dr. FISK. Well, one must note that unless the 37 in Asia were installed, that the system would have a lesser capability than was indicated in our report. The reason for this is that if you draw some arbitrary line, for example, between Russia and Red China, and you have no stations on one side but have the full complement on the other, then you obviously decrease the identification probability in regions that are reasonably close to that border. That is, you would be looking for something down there, you would have no stations here, but stations up here, so you would have a harder time identifying and detecting than you would for an explosion or an event that took place where the event was surrounded by stations.

Senator GORE. I read the report carefully, some of it several times; I also reviewed parts of the procedure at the Conference. I know that the scientists gathered wanted to avoid political questions, and I do not wish to involve you in them now, either Asiatic or otherwise, but the facts stand as you have testified, that if no stations at all are installed in that geographic expanse that we call Red China, then the efficiency of the stations, even if the Soviet Union were included, would be modified.

Dr. FISK. Well, may I just make this observation, Senator?

Senator GORE. I am referring to those stations near the borders on which you would depend for overlapping signals and detections.

Dr. FISK. Well, a simple point of—perhaps you intended it this way—that the efficiency of the station itself would not be affected, but the efficiency of the system as a whole.

Senator GORE. That is what I meant to say.

Dr. FISK. You are quite right. It would have a lower capability if you arbitrarily chop off some substantial segment of this.

Senator GORE. As the distance from the installed stations increased in the direction of the area in which no stations have been installed, then the signal would become fainter by the mile.

Dr. FISK. I believe I understand you, and I believe this is a correct statement; yes, sir.

Senator HUMPHREY. Is there any direct relationship to the magnitude of the signals on the basis of miles? In the Rainier test some better signals were obtained at long distances than at short distances.

Dr. FISK. May I ask Dr. Romney to take this one on?

Senator HUMPHREY. Some of the best signals came from a thousand miles away, and some of the worst ones from under 600 miles away.

Dr. ROMNEY. Yes, this is true; the seismic signal is not a simple function of distance. Nevertheless, the farther away you go from your stations, from the bulk of your stations, the worse off you are. And I think this is an answer to the Senator's question.

Senator GORE. I did not say the size of the signal, but perhaps I did say weaker.

As I understand it, your difficulty in distinguishing becomes greater in proportion to distance.

Senator HUMPHREY. Always?

Dr. ROMNEY. Roughly, this is a true statement.

PRESENT SEISMOGRAPH STATIONS WOULD CONTINUE TO OPERATE

Senator HUMPHREY. Just to pursue this point, if 37 stations were installed in the Soviet Union, this would not mean that the regular seismograph stations in Japan, in India, in Russia, and elsewhere throughout Asia, would be inoperative, does it?

Dr. ROMNEY. No.

Senator HUMPHREY. Our own Coast and Geodetic Survey, for example, already received information from other seismic stations.

Dr. FISK. That is correct.

Senator HUMPHREY. Records from these stations are not excluded under your agreement as being data to be examined?

Dr. FISK. This was a subject of very considerable debate. Our position was this should be considered as supplementary data, but one should not place reliance on it for several reasons: One, such stations are not uniformly well equipped, but more importantly, that they would not be under the control of whatever organization was established for carrying out this operation, and the question of the validity of the data would be raised.

GENEVA CONCLUSIONS CALLED FOR USE OF EXISTING STATIONS

Senator HUMPHREY. But it is data to be considered. As the Geneva conclusions say:

> The remaining 10 percent or less of cases will require the analysis of additional seismograms where this is possible—

This is referring back to the 10 percent of the cases in which identification is doubtful—

> and for this purpose use must also be made of the data of the existing network of seismic stations. If required, these supplementary stations should be further equipped with improved apparatus.

That is an agreed-upon provision, isn't it?

Dr. FISK. Yes, it is an agreed-upon provision, and I would just like to emphasize that we look upon this in all cases as supplementary data to the main network of control posts.

QUESTION OF NUCLEAR TESTS IN COMMUNIST CHINA

Senator HUMPHREY. Does our Government feel that there have been any atomic tests, underground tests in China?

Dr. FISK. I am afraid I can't answer that, sir.

Senator HUMPHREY. Is anybody here able to answer that?

Senator GORE. I believe we have no information whatsoever on underground tests in the Soviet Union. We do not know whether they have conducted them or whether they have not. Nor do we know about China.

[Deleted.]

Senator HICKENLOOPER. Yes, there was a big explosion in China, but it is alleged to be a high-explosive detonation and not an atomic explosion. I say it is alleged to have been.

Senator HUMPHREY. This is the one we talked about last year.

[Deleted.]

Senator HUMPHREY. As of today the U.S. Government has relied on existing seismograph stations for the purpose of determining whether or not any tests have taken place, and if so, where they have taken place, their yield and nature, is that correct?

[Deleted.]

CONTROL SYSTEM WOULD BE COMPOSED OF NEW FACILITIES

Senator HUMPHREY. But there are existing facilities. The report calls for 37 supplementary new facilities, does it not?

Dr. FISK. In Asia, yes, sir.

Senator HUMPHREY. Thirty-seven new stations over and beyond the stations by which we obtain all our information at the present time.

Up until this hour of this year 1959, our Government has contented itself, in terms of detection of tests for purposes of national security, in order to know what the Soviet Union or any other country was doing, with the existing facilities. The report that is being discussed now contemplates 37 more facilities in the Asian area, right?

Dr. Fisk. Yes.

Senator GORE. I think we need a little clarification there. The scientific report refers to 37.

Senator HUMPHREY. Yes.

GENEVA NEGOTIATIONS NOT DISCUSSING COMMUNIST CHINA

Senator GORE. But insofar as the negotiations in Geneva are concerned, the delegation is under instructions not to mention Red China. There is no plan or program for Communist China.

Senator HUMPHREY. I agree with that, Senator Gore, but what I am getting at is, as of today the Government of the United States has relied upon existing facilities for any detection relating to explosions in Red China. Whether any new stations are placed in Red China or not for the purposes of detection, this report of the Geneva Conference of Experts contemplates 37 more stations in the Asian area someplace.

Is that correct, Dr. Fisk?

Dr. FISK. Yes.

Senator HUMPHREY. Dr. Romney?

Dr. ROMNEY. Yes.

Senator GORE. "Some place" needs qualification, too.

Dr. ROMNEY. The capabilities of this recommended system are quite different from the existing capability. [Deleted.]

Senator HUMPHREY. Yes, I understand it.

Dr. ROMNEY. So if we are interested in detecting small bombs, then this kind of measure is essential.

If we are willing to go on with the kind of capability we now have, then nothing is required.

CAPABILITY OF EXISTING SYSTEM

Senator HUMPHREY. Under existing detection conditions the United States was able to detect an 8 kiloton explosion in China. I don't say nuclear, but a yield of approximately 8 kilotons, that is right.

Senator HICKENLOOPER. That is correct; but not identify it as an explosion. There is a difference between identification and detection, and I think we ought to keep that clear.

Senator HUMPHREY. If we were to sign a treaty with the Soviet Union and the United Kingdom on the prohibition of nuclear tests, based on the body of conclusions of the Geneva Conference of Experts, would the United States be prohibited from using existing facilities and means of detection of tests for its own calculations?

Senator HICKENLOOPER. Again I insist that we differentiate between the terms "detection" and "identification." It is possible to detect a disturbance, as I understand it, without necessarily always identifying it for exactly what it is.

CAPABILITY OF INTERNATIONAL CONTROL SYSTEM INDEPENDENT OF NATIONAL SYSTEMS

Senator HUMPHREY. I understand. My point is a very simple one. Did the conclusions drawn at the Geneva Conference of Experts exclude data from existing seismograph stations for the purposes either of detection or identification?

Dr. FISK. The system here described, Senator, which includes 180 control posts, so-called, distributed around the globe, has certain, we believe, has certain capabilities and certain limitations as described here, exclusive of any presently existing monitoring system.

Senator HUMPHREY. Do I understand this capability is over and above the capability of existing monitoring systems?

Dr. FISK. It is, I would say essentially unrelated to—we never discussed any of our stations. We discussed methods. They did not discuss any of theirs. What we were talking about was a new system.

Senator HUMPHREY. This is a very important point. Am I to understand, then, that if we were to sign a treaty at Geneva, from that time on all the mass of data that the Coast and Geodetic Survey gather would not be taken into consideration at all for the purpose of detecting or identifying tests?

Dr. FISK. From the point of view of our own country, I should think we would continue to use that system very thoroughly and completely.

Senator HUMPHREY. All right.

Dr. FISK. But not necessarily make it part of an international system.

Senator HUMPHREY. I understand that. That is the information I am seeking. From the point of our national security we do not then exclude the existing facilities that we have, as a network for purposes of identification and detection of underground explosions.

Mr. FARLEY. Senator, could I speak to this? You are asking what our national approach is, which is perhaps a little difficult for Dr. Fisk to answer.

[Deleted.]

CONTROL SYSTEM WOULD USE NATIONAL STATISTICS TO HELP DECIDE DOUBTFUL CASES

Senator HUMPHREY. I have asked these questions because I was under the impression that it had been agreed at the Geneva Experts Conference to use the data of the existing network of seismic stations. The report of the Experts says:

> For this purpose use must also be made of the data of the existing stations. If required, these supplementary stations should be further improved with additional apparatus.

Dr. FISK. That is ambiguous, I agree, Senator Humphrey. What was intended there, and I think the verbatim would show it, would be the kinds of stations that exist in universities and seismic institutes of one sort or another. [Deleted.]

Senator HUMPHREY. But that provision in the report does have a bearing on the data accumulated by the Coast and Geodetic Survey. It may or may not have; it could or could not.

Mr. FARLEY. I was going to say, Senator, we really identify two situations. While there are interrelationships, each of them is really independent.

The expert system would be one with a capability for monitoring the effective operation of the test suspension which would not be dependent on getting information from other sources, but which would recognize that such information might be a useful supplement, and that, I think, is what the Experts' report said on that point.

Senator HUMPHREY. Yes, sir.

Mr. FARLEY. In addition, from the point of view of the United States Government, we would certainly plan to use the information from all sources. [Deleted.]

Senator HUMPHREY. I understand.

[Deleted.]

Senator GORE. May I ask a question?

Senator HUMPHREY. Yes, please.

Senator GORE. I would like to ask these questions of both of you gentlemen, or anyone else here who was at the Experts Conference.

Mr. FARLEY. Mr. Spiers was.

PAUCITY OF SOVIET DATA ON DETECTION

Senator GORE. I will make this statement and then ask you to enlighten me if you have any information on it.

I have been puzzled at the paucity of scientific data that the Russians seemed to bring to the Experts Conference. I have been puzzled that they claim no particular knowledge or great knowledge in this field, and I wonder whether they realized that our experts were making a mistake, or whether they were blissfully ignorant of the capabilities of distinguishing underground signals.

Do you have any information on that? As one goes through the verbatim records of the Conference, the Soviets seemed to take strong

positions and argue long, with a good deal of theory, but without too much scientific fact, but then they would yield and seemed to be under compulsion to agree.

What is your view of that, from your experiences at Geneva with the Soviets? Do you think they have or have not had underground tests? Do you feel that they had information that they did not divulge?

Dr. FISK. I can only give you an impression.

Senator GORE. That is what I want. I am puzzled after reading the verbatim records, and I suppose you are.

NO EVIDENCE OF SOVIET UNDERGROUND TESTS

Dr. FISK. Well, we were puzzled at times.

I think it is fair to say that there was no evidence at the Conference in Geneva this past summer that they had conducted any underground tests. There was no evidence of that from any source.

Senator GORE. Nor that they had not?

Dr. FISK. Well, it works both ways. It is a little more difficult to prove a thing has not been done.

Senator GORE. Yes. From what I read they made no reference to underground tests; they didn't say they had had any, they didn't say they had not.

Dr. FISK. That is true.

SOVIETS MANIFESTED NO INTEREST IN SMALL WEAPONS

Further, they did not appear in our discussions to have a great interest in small weapons. That was a point that kept coming up time and again in our—it was never a matter of discussion across the table, but it was always a matter of interest to many of us, no real interest at that time in small weapons.

Senator GORE. You mean they manifested no interest?

SOVIETS BELIEVED IDENTIFICATION PROBLEM NOT DIFFICULT

Dr. FISK. Yes, of course. We saw no interest on their part. I really believe, and I believe Dr. Romney should speak to this point principally, because he was in rather intimate detailed technical discussions on seismology on many occasions, and understood this very well, I really believe that they feel that the detection and identification is easier than we thought. I think they believed this, and I think that they recognize, as we must, that there are possibilities for improvement, but I would like to defer to Dr. Romney, who had much more detailed contact with them.

Dr. ROMNEY. I think that I could add to what Dr. Fisk has said. I believe the implication is strong that they have not conducted underground explosions, nuclear explosions, because we beat them on the head time and time again with our Rainier experience, and I would have thought at some point they would have been provoked into saying, "We have similar experience."

I also agree with the point Dr. Fisk made that they probably think things are simpler than we think.

I received several lectures from their seismologists on the effect of an explosion in a semi-infinite half space, and how such an explosion would be easily identifiable, and I said, "Look out the window. Does this look like a semi-infinite half space," and of course, it doesn't. The earth is very complex.

SOVIETS APPEARED TO SPEAK FROM THEORY, NOT PRACTICE

They were talking theory, we were talking practice, and there was a difference in our beliefs, and I believe this is the fundamental difference in our beliefs.

In theory it is all very simple; in practice—I should say in the simple theory it is all very simple—in practice it is very difficult.

Senator GORE. You have confirmed my impression that the Soviets talked theory and the western delegation talked data.

Dr. ROMNEY. I think it is essentially that, as far as nuclear explosions goes.

Dr. FISK. So far as underground nuclear explosion is concerned, this is true. I think it is only fair to observe that they have produced good data on many points, but they had no data that they produced on underground nuclear explosion.

Senator HICKENLOOPER. If the Soviets produced any data, it would be subject to testing. I have attended a half-dozen meetings at which various phases of this problem were discussed, but it is conceivable to me that they have more data than they appeared to have at those talks. Four or five years ago, did not one of the Soviets announce that they had dug a channel using atomic explosives—something like our Plowshare operation? Whether they did or not we don't know. We have never been at the site. However, I certainly wouldn't start with the assumption that the Soviet Union doesn't know a considerable amount about earth shocks from underground tests. They probably have conducted some underground tests, and probably are putting on the face of ignorance, saying "We are simple boys and we don't know much about this. We will take your word for it."

It is entirely possible that they have had enough underground tests so that they knew the results of the Rainier shot were not adequate. I don't blame the experts. The experts had to take the data that were given to them on the Rainier shot. Other shots have proven that the Rainier data were not reliable at that point.

I have not been able to go along with the idea that the Soviets have not had any underground tests, yet I have no hard evidence that they have. It would be inconceivable to me, with the operations they have had, that they have not explored this field, as well as almost any other field.

Senator HUMPHREY. Senator Gore.

Senator GORE. There was another gentleman here who was at the Geneva Conference of Experts. I wonder if he has anything to add.

Senator HUMPHREY. Mr. Spiers.

Mr. SPIERS. I think the question you asked, Senator, was essentially one of the reactions of scientists to other scientists, and not being a scientist myself, I don't think I have any impressions that either differ or would add to any of those of Dr. Fisk or Dr. Romney.

Senator GORE. Thank you.

SOVIET SCIENTISTS CRITICAL OF NEW DATA

Senator HUMPHREY. An article appeared on January 20 in Pravda by two of the Soviet scientists that attended these Geneva talks, Y. V. Riznichenko and L. Brekhovski, corresponding members of the Academy of Science of the U.S.S.R. I would like to get both from Dr. Fisk or Dr. Romney, or anyone else who would like to comment on it, their opinion on one of the points that was made. The Soviet scientists appear to object to the inference that the Geneva technical conclusions on the seismic method of detecting tests were based primarily on the results of one nuclear underground test.

This article was written after the new data had been presented. They say, and I quote:

> * * * it has to be pointed out that the conclusion of experts—drawn up in August 1958—regarding seismic methods of detection was by no means based solely on the data of the single Rainier subterranean explosion carried out by the Americans in 1957, as the authors of the note are trying to make out * * * the experts were able to draw on many years' experience in the investigation of many thousands of earth tremors as well as many hundreds of seismic registrations of large TNT explosions, accumulated by the seismological services of the whole world. Naturally, alongside all this ample material, the experts carefully studied also all data bearing on the Rainier explosion.

What are your comments on this?

BASIS OF GENEVA CONCLUSIONS

Dr. ROMNEY. I don't think it was claimed that the conclusions were based entirely on Rainier. This statement, I believe, is misleading, simply that. The Soviet statement is misleading.

Senator HUMPHREY. What about the Soviet statement to the effect that the conclusions drawn by the experts were based on, as they say, and I quote here again:

> many years' experience in the investigation of many thousands of earth tremors as well as many hundreds of seismic registrations of large TNT explosions—

and so forth.

Dr. ROMNEY. That is certainly true.

Dr. FISK. Yes, this is entirely true. The point is that there have been many, many investigations of earthquakes, on the whole the larger ones rather than the smaller ones. There have been many seismic investigations of underground explosions of TNT, and we spent a good deal of time discussing these, our data, Canadian data, Russian data, and so on. And of course the U.S. Government has made seismic measurements on nuclear shots that are above the ground, which are not completely irrelevant.

Now, taking all of these things together, one has a pretty fair understanding of many of these phenomena. But nevertheless, the best piece of evidence for calibrating our system was the Rainer shot, and I think this is where you rest; you learn a great deal from all of this experience that is accumulated over the years. But the calibrating point which puts our conclusion out by a factor of a third on detection and two-thirds on identification, so far as the actual signal is concerned, rests on that one piece of evidence.

BASIS OF NEW DATA

Senator HUMPHREY. Would you mind if we would just read to you a few more of the excerpts from this article? I think my colleagues might be interested in this article and your reaction to it.

The Soviet scientists attempt to state that the new data presented by the United States are only valid for one explosion, Logan, and not for the other two, Blanca and Tamalpais. They claim:

It has to be pointed out that the data on one of these three explosions, a very small one of a power of 0.1 kilotons, is not actually quoted or utilized in the note—

This is the note relating to the new data that was sent recently to the Geneva Conference—

the authors of the note failed to consider the results of the registration of the Blanca explosion in other seismological stations of the United States, whose number exceeds 90, as well as in the stations of Sweden and other countries situated at a distance of thousands of kilometers from the epicenter. Nor do the authors make allowance for the important circumstance that the Blanca explosion was accompanied by a destruction of the earth's surface and a large ejection of soil so that the energy of its seismic effect must be smaller than is the case with a subterranean explosion of same power.

The Soviet scientists conclude that—

Thus all these far-reaching conclusions are based as a matter of fact only on the data of the one new Logan explosion. Similarly, the authors do not, for some unknown reason, take the registration of the Rainier explosion carried out in many other stations into consideration.

What do you have to say about all of that?

Dr. ROMNEY. It was quite a lot.

Senator HUMPHREY. That is right. You apparently have the article there.

Dr. ROMNEY. Mine doesn't read like yours; someone else did the translation.

Senator HUMPHREY. Is it substantially different?

SEVERAL UNDERGROUND TESTS USED IN NEW DATA

Dr. ROMNEY. It may be yours is rearranged somewhat. It says the same thing; yes, sir.

Well, the fact is in the first place, that this information is not based exclusively on Logan. The small yield explosion was used, in fact was used in a very important way. It gave us our scaling law, or it was very important in establishing our law of the size of the signal which would be given by energy releases other than the particular ones we had.

The point concerning Blanca: I am sure that, or I suspect, at least, they made this statement in the best of faith. However, Blanca did not blow out; it fell in, and it fell in many seconds after the seismic effect had passed. The seismic waves were a hundred kilometers away by the time it collapsed.

So that we actually did have the shots we claim. We had the small shot; we used it. We had Logan; we used it. We had Blanca, and we used it. And as a matter of fact, we had a couple of other shots.

Senator HUMPHREY. They don't deny that you used it. They deny the relationship to your conclusions.

Dr. ROMNEY. Yes. I suspect they actually had not looked very carefully at the data. I think this is very clear.

INSTRUMENTATION REQUIRED BY GENEVA CONCLUSIONS

Senator HUMPHREY. The Soviet scientists also criticize the equipment used to record these three underground blasts. They state:

> The U.S. note briefly describes the seismological equipment used in the observations. The authors assert that it tallies with the recommendations of the Geneva Conference of Experts. This is not true. The Conference of Experts recommended the establishment by the control posts of a set of 10 grouped vertical seismographs with an amplification of about a million and a maximal sensitivity for registering vibrations with a period of about one second and a sufficiently wide pass band. In addition, the establishment of several sets of equipment with a wider pass band was also recommended.
>
> The American seismologists, however, applied equipment with a considerable lesser amplification. A narrow pass band and a maximum of sensitivity for vibrations with a period of about 0.3 second. There was no equipment with a wide pass band. To a specialist it is clear that such equipment does not tally with the recommendations of the expert's conference and is less sensitive in particular also in registering the amplitude of the first vibration of a longitudinal wave, which is an important factor in determining the period of the source of the seismic feature.
>
> The scientists of the U.S.S.R. also complain that the temporary stations registered the signals of the Blanca and Logan explosions more poorly than the permanent stations.

Dr. ROMNEY. Can I start commenting before you get further?

Senator HUMPHREY. I wanted to read the whole statement to you. I have some questions relating to it.

INSTRUMENTATION USED BY UNITED STATES

Is the criticism valid that the instrumentation was not according to that recommended by the experts at Geneva?

Dr. ROMNEY. It was not claimed that the equipment at these stations is identical to what a control post would have, according to the Geneva recommendation. This is an impossibility, for very good reasons, if you read what the recommended equipment was. These are very elaborate stations, and we could not do it; but neither do we claim, and in what was given to the Russians it was not claimed, that these were Geneva-type stations. It was stated precisely what was at the stations in the way of equipment. We didn't claim what they say.

Senator HUMPHREY. Their point is that without that kind of equipment you should not draw conclusions about what would be detected by the control posts.

Dr. ROMNEY. Yes. Well, this makes good reading in Pravda, but it really isn't true. You certainly have to make allowances for the improvement you expect to get.

Now the improvement you would get by having 10 instruments instead of 1 can be calculated rather simply.

The improvements you would get by using other kinds of instruments are more difficult to account for. That is certainly true.

We have only claimed, however, in the information that was given to them, that based on the kinds of considerations that we discussed at Geneva, the situation is not as good as the Geneva prediction.

DATA FROM TEMPORARY STATIONS

Senator HUMPHREY. A second criticism in this article was that undue weight was given in determining the magnitude of the two shots, Blanca and Logan, to the recordings at temporary stations, in relation to the recordings at permanent stations.

Dr. ROMNEY. Well, as a matter of fact, the recordings at temporary stations and recordings at permanent stations, when treated separately, gave the same result. The temporary stations gave the same magnitude as the permanent stations, treated separately.

Senator HUMPHREY. The same magnitude for which shots?

Dr. ROMNEY. For Logan and Blanca. To illustrate: The temporary stations gave a magnitude of 4.4 for Logan; the permanent stations gave a magnitude of 4.4 for Logan. There is no difference, plus or minus.

Yes, there is an uncertainty in these estimates, of course.

Senator HUMPHREY. Did the scientists give more weight to the magnitudes registered at the temporary stations than the magnitudes registered at the permanent stations? You say that the magnitudes from temporary and permanent stations were not different.

Dr. ROMNEY. The same.

Senator HUMPHREY. Would you say that this point in the article is not only a misinterpretation, but an outright misrepresentation?

Dr. ROMNEY. Well, the implication is certainly misleading, yes.

Senator HUMPHREY. The article states that the temporary stations registered the signals of Blanca and Logan explosions more poorly than the permanent stations.

Dr. ROMNEY. This is untrue. As a matter of fact, the temporary stations on the average gave better results than permanent stations at the same distance, and the reason is very simple. The temporary stations had better equipment than the average of the permanent stations at the same distances.

CALCULATIONS CONTAINED MARGIN OF ERROR

Senator HUMPHREY. The Soviet scientists questioned the precision of the calculations of magnitude. I quote from the article:

> The precision of the calculations and specifications, as the authors of the note admit themselves, is not high.

Is that correct?

Dr. ROMNEY. That is correct.

Senator HUMPHREY [reading]:

> Thus, the seismic intensity of the explosions expressed by figures between 4.1 and 5 is gaged with a margin of 0.4 more or less.

Do the estimates for the magnitude for Blanca and Logan with a margin of error plus or minus 0.4 throw in question the precision of the estimates?

Dr. ROMNEY. I would like to say here I don't completely understand what the Russians are talking about at this point. I will have to think more about it.

What I can say is this: The use we make of the magnitude is in estimating the number of earthquakes of about the same size.

Senator HUMPHREY. Wasn't there some change of the calculations on the magnitude of Rainier as a result of the new data?

Dr. ROMNEY. Yes. We believe that the Rainier magnitude was overestimated originally.

Senator HUMPHREY. What was the original estimate of the magnitude of Rainier?

Dr. ROMNEY. 4.25.

Senator HUMPHREY. And the new estimate was what?

Dr. ROMNEY. About 4.1.

Senator HUMPHREY. That meant for identification purposes about 10,000 more earthquakes?

Dr. ROMNEY. No.

Senator HUMPHREY. How many?

Dr. ROMNEY. It isn't that single thing that does it.

Senator HUMPHREY. Did not that open up the problem of identification——

Dr. ROMNEY. Yes.

Senator HUMPHREY (continuing). By adding a substantially greater number of earthquakes?

Dr. ROMNEY. Let me say this, let's not say the new calculations did this; let's say the new data did this.

Senator HUMPHREY. The new data did that?

Dr. ROMNEY. Yes.

Senator HUMPHREY. When you revised the calculations as to magnitude, it made it more difficult, on the basis of your original estimates, to identify a nuclear explosion as related to an earth tremor, is that right?

Dr. ROMNEY. It was a factor which contributed to it.

Senator HUMPHREY. It was a factor?

Dr. ROMNEY. Yes.

Senator HUMPHREY. And that factor has been brought forth as one of the reasons for the increased difficulty in proper identification?

Dr. ROMNEY. The increased numbers of events; yes, sir.

Senator HUMPHREY. Yes, sir.

Dr. ROMNEY. Could I finish this remark?

Senator HUMPHREY. Yes, go ahead.

EARTHQUAKE MAGNITUDES DETERMINED WITH MARGIN OF ERROR

Dr. ROMNEY. Concerning the accuracy of determining magnitude, the point is that earthquake magnitudes are also determined to about plus or minus 0.4 of a magnitude unit. So that this kind of a spread is consistent, the kind of spread in the magnitude estimate which we got from a blast is rather consistent with the kind of spread you would get in estimating the magnitude of an earthquake. For this reason I don't quite understand the Soviet criticism.

Senator HUMPHREY. I understand that the calculation of magnitude becomes very important in terms of determining approximately how many earthquakes the system has to identify.

Dr. ROMNEY. Yes, it does, indeed.

Senator HUMPHREY. If the Rainier calculation was readjusted downward from 4.25 to 4.1, and, therefore, made it appear there would be many more earthquakes to identify than believed previously, then do not these estimates with margins of error of 0.4 for the Blanca and Logan explosions become very important in the problem of identification of earthquakes and nuclear explosions?

Dr. ROMNEY. I am not sure of just exactly what you are getting at.

Could I try to answer the question in this way, that we have developed a relation between yield of underground explosion and the size of earthquake, artificial earthquake, it will produce.

Now this relationship is based not on Rainier or Logan or Blanca or any other shot, but on all the underground shots which we have observed, nuclear shots.

The fact that we have changed the Rainier magnitude a little bit is not a significant contribution to this law, this relation between the size of the explosions and the size of the earth disturbance.

SENATOR HUMPHREY. I agree with that.

But the magnitude is significant, is it not, in determining whether or not earth disturbances are earthquakes or other types of disturbances?

LOWER MAGNITUDE OF EXPLOSION MEANS MORE EARTHQUAKES TO IDENTIFY

Dr. ROMNEY. Yes, that is the point. What this new relation, based on all the data, shows is that an underground explosion produces a smaller disturbance than we had thought before.

This, in turn, means that there are very many more earthquakes of the same size, because the numbers of earthquakes increase very fast as the size decreases, and this then aggravates the inspection problem.

Senator HUMPHREY. The question then was, do the estimates for the magnitude of Blanca and Logan, with a margin of error plus or minus 0.4, throw in question the precision of the estimates?

Dr. ROMNEY. Seismologists do not claim the estimates are very precise and, in fact, the estimates that they have given have taken into account this kind of uncertainty.

You will notice when a seismologist says there are so many earthquakes of a given size, he is tempted not to say that there are a thousand earthquakes, but there are 500 to 2,000 earthquakes.

Senator HUMPHREY. Yes.

Dr. ROMNEY. We do not know exactly.

Senator HUMPHREY. I would like to ask Mr. Murphy, the Chief of the Seismology Branch of the Coast and Geodetic Survey, if he has any comments on this technical field that can enlighten a layman.

STATEMENT OF LEONARD MURPHY, CHIEF OF THE SEISMOLOGY BRANCH OF THE U.S. COAST AND GEODETIC SURVEY

Mr. MURPHY. Since I have not actually checked the data, I cannot quote figures which are better than those released by the DOD on December 22.

However, I am curious about the totals given in that particular release about the kiloton yields, which are equivalent to certain magnitudes.

I would say that I am in agreement with them, but I would be curious about the correlation between these magnitudes and their frequencies relative to earthquake statistics, so far as world distribution is concerned. It is a very difficult thing to check.

However, we have to base it on limited information available in earthquake countries like the United States or other areas of the world where there are sensitive seismographs operating. I am interested in the accuracy of determining the magnitude for the smaller earthquakes where we have a good distribution of seismographs, seismographs which are well calibrated.

USUAL MARGIN OF ERROR

It seems that we can determine magnitudes probably more accurately than plus or minus 0.4 of a unit.

That does seem to me to be a rather wide range, because in our regular operations, we have received calculations of magnitudes from well-distributed seismic centers around the world.

The range of magnitudes computed by different sources does not very often become greater than plus or minus a half unit.

Where there is a good distribution of earthquakes in an area, there are good instruments, well calibrated, and people who are fairly well acquainted with magnitude determination, we are able to reduce the range to plus or minus 0.1 or 0.2.

Senator HUMPHREY. Are you saying that the plus or minus 0.4 is rather large?

Mr. MURPHY. It seems to be large. In terms of some calculations it may be justified. But from our experience at the Coast and Geodetic Survey in receiving data from well-known centers, Berkeley, Caltech, Rome, Prague, and so on, the range is below that value for the more localized earthquakes.

Even for most distant earthquakes it does seem to be a somewhat large range. I would say it should be plus or minus a quarter of a unit.

Senator HUMPHREY. When you say a quarter of a unit, what do you mean?

Mr. MURPHY. 0.25.

EARTH STRUCTURE IN WHICH TESTS CONDUCTED

Senator HICKENLOOPER. Mr. Chairman.

Senator HUMPHREY. Yes, Senator Hickenlooper?

Senator HICKENLOOPER. Mr. Chairman, I wonder whether whatever data we do have on the magnitude is not wholly inadequate because all of the tests we have had have been in just one type of earth structure? We have not had underground atomic explosions of various sizes, in various structures, and nobody can say for sure just exactly what the measurements will be in different types of structures.

So it seems to me reasonable that the basis for our data today is wholly inadequate for really accurate determinations of measurements.

If we had had three different tests in three different earth structures, we probably could have come to a better conclusion.

But with two or three explosions in the same area, in practically the same type of earth structure, only one answer is obtained and that is the signal which will be received from an explosion in that type of structure at a certain distance. There are reasonable calculations on that.

Senator HUMPHREY. I think that is a very important point.

DIFFICULTY OF LOCATING EXACT SITE OF UNDERGROUND EXPLOSION

Senator HICKENLOOPER. I would like to ask another question.

Suppose the seismograph system gets a signal which has the characteristics of either an underground explosion or certain types of earthquakes.

How can it be determined whether or not there has been an explosion if there is a determined effort to conceal it?

Knowing exactly where the Rainier test was conducted, our scientists tried to put a hole down from the top and missed finding the cavity. Finally they had to dig a tunnel because an oil drill could not locate the cavity.

If location of the site can only be determined within so many square miles, and if somebody really wants to cheat, even if on-site inspection is permitted, how many holes would need to be drilled down, and how many tunnels would need to be dug? I do not know.

It looks to me like these problems are very, very great indeed. If a system is designed, it should include an accurate system of verification.

We can detect explosions, and we think we can identify them, but the proof of the pudding is in the eating; that is, can we go to the site and either say, "Yes, a nuclear weapon was exploded," or it was not? To me the difficulty of verification seems tremendous.

I do not say that we should throw up our hands and quit, but sometimes I think we overgeneralize on these things.

POTENTIALITY OF FURTHER RESEARCH ON IDENTIFICATION

Senator HUMPHREY. We have a statement from Mr. Frank Press relating to this. He was invited but could not attend this hearing. He states:

> Very little research has been conducted on the identification problem. An assessment of the possibilities of research based on results in related fields could justify a more optimistic position, one still within the limits of uncertainty of the initial motion method.
>
> That the Geneva conferees recognized the potentialities of research is shown by their inclusion of long period seismographs in the monitoring system when the specific contribution of these instruments could not be evaluated without further research.
>
> Preliminary results of work now in progress at Columbia University and the California Institute of Technology confirm this optimism and point to long-period seismograph recordings of surface waves as a significant new factor in the identification problem. Other preliminary studies now underway show the possibility of improvements in the first motion method which may be realizable with minor modifications in the Geneva system. Whether an identification capability for 5 kilotons or less can be achieved is speculative at this time. More underground tests will be required before this question can be answered.[1]

ADDITIONAL TESTS FOR IMPROVING DETECTION SYSTEM

Senator GORE. I would like to inquire right there, Did any of our scientists or our group in Geneva last summer suggest the necessity or desirability of additional tests to perfect or determine identification methods and procedures?

Dr. FISK. Do you want to answer that?

Dr. ROMNEY. I want to say I did it privately and received a tongue lashing for my immoral position in return. But as far as the public

[1] The full text of Dr. Press statement appears on pp. 51–52.

discussions were concerned, I do not believe there is a conclusion on this.

Dr. FISK. There was not a formal conclusion on this. There was some discussion on it.

Senator GORE. The experts' report has qualifying language in a great number of instances, but I did not find any qualification, any reservation, or any statement that additional underground tests would be necessary in order to prove or develop or perfect detection or identification procedures.

I hope you were not awed by this tongue lashing.

Dr. ROMNEY. I was not awed.

I told them that was the only way I knew to answer some questions, and if they had a better way, they should suggest it, which they did not do.

But I believe there is recognition that tests would be required by both sides.

Now some of these tests certainly can be high-explosive tests.

Senator GORE. You said there is recognition by both sides, but there is nothing in the report that indicates that.

Dr. ROMNEY. I am sorry. If I implied that both sides have recognized the need for underground nuclear explosions, I withdraw the statement. I did not mean that. But I meant I am certain that both sides feel the system needs tests of various sorts, and that as far as the seismic system is concerned, there is a great deal that can be done by high-explosive tests, very large high-explosive tests.

Senator GORE. You say you made the suggestion privately in your talks. In the recorded conferences was any such suggestion made to the Russian delegation?

Dr. FISK. As I recall, sir, there were no such recorded discussions in our formal meetings.

Senator GORE. Thank you, Mr. Chairman.

NO DISCUSSION OF TESTS TO IMPROVE DETECTION SYSTEM

Senator HUMPHREY. Has there been any discussion of this in the Geneva Conference presently underway?

Mr. FARLEY. I do not recall it. Do you recall any?

Mr. SPIERS. No.

Senator HUMPHREY. When I was talking to Premier Khrushchev, he constantly reminded me that we were seeking to have tests for experimental purposes.

Mr. FARLEY. Tests for peaceful applications such as oilfields and what not.

Senator HUMPHREY. It would be presumed, would it not, that you would be making some identification and inspection tests at the same time?

Mr. FARLEY. This would be a very advantageous way to do it.

I was only saying that there has not been specific discussion of whether the control system might itself explode some nuclear weapons for its own purposes.

Senator HUMPHREY. But if you did have explosions, there is nothing that precludes trying to see whether or not the results would help in perfecting a detection system.

Mr. FARLEY. That is right; and so far there has not been any discussion even of that point.

We simply identified it in our initial presentation of what we wanted to cover.

Senator HUMPHREY. Yes, that is right.

The answer that I received from Premier Khrushchev was that it was preferable to have no more tests, but if more were conducted they had to be equal between their side and ours, and ours means the United Kingdom and the United States as one, undoubtedly, in that interpretation.

Dr. FISK. Might I make a comment, Senator, that bears on this general question?

Senator HUMPHREY. Please go right ahead.

HUNDRED PERCENT FOOLPROOF SYSTEM IMPOSSIBLE

Dr. FISK. The question is raised by Senator Hickenlooper, and also by Senator Gore that might be phrased this way: How much is enough?

Now we have to acknowledge, and we have recognized throughout that the system that we talked about and agreed upon as a system to be considered by governments had certain flaws, certain loopholes.

The concept of a hundred percent foolproof system is meaningless. So the question really is how much is enough.

I do not know. We tried to approach this whole question very objectively, and tried to point out what we considered to be the capability of the system and also as clearly as could be what are the limitations, and there are gaps in the system, and they are stated here as well as we could state them.

Let me call attention to one paragraph where we have said that:

> Although the control system would have great difficulty in obtaining positive identification of a carefully concealed deep underground nuclear explosion, there would always be a possibility of detecting such violation by inspection.

Here you would have to assign probability, as stated by us in other parts of the report, but I would like to make clear that a system of this kind could do a good deal by way of detection, and a good deal by way of identification, but it is not, and it cannot be, a 100-percent foolproof system.

I think we must recognize this. There are going to be ways, with ingenuity, to make it very difficult.

There are going to be ways with ingenuity to make the system better. You can do it both ways.

BASIS OF NEW DATA

Senator HUMPHREY. A Defense Department release of January 16, 1959, concerning the new data states:

> It is now estimated that the first motion must exceed the background noise or natural unrest of the earth, by at least a factor of 3 to 1 instead of the previous estimate of 2 to 1 if the direction of first motion is to be reliably determined.

My question is this: Was the estimate of 2 to 1 based solely on Rainier or was it based on the observation of a number of TNT explosions, plus observation of earthquakes?

Dr. ROMNEY. Well, this particular estimate was based on some experience with earthquakes and some measurements of the size of the first motion from Rainier at very small distances where Rainier was detected.

Senator HUMPHREY. Any TNT explosions?

Dr. ROMNEY. No; they would not be pertinent unless they were buried, deeply buried.

Senator HUMPHREY. That is what I mean.

Dr. ROMNEY. Yes.

The specific problem that we found with this is that the buried explosions produced smaller first motions than we had expected, and the feeling is that they are smaller even than many earthquakes.

We are conducting a study now of several hundred earthquakes to try to get better statistics on this, on the figure, but I would say we have not anticipated the specific difficulty which we encountered in Hardtack, phase II, in determining the first motion.

The previous estimate was based in large extent on a kind of practical judgment.

HIGHER SIGNAL TO NOISE RATIO CONSIDERED NECESSARY

Senator HUMPHREY. If the estimate of 2 to 1 was based only on Rainier, that is one thing, but if the estimate of 2 to 1 was based on Rainier, plus TNT explosions, plus earthquake observations, that is another thing.

If both the Rainier test and earthquake observations were used in arriving at the estimate of 2 to 1, why do the results of two or three additional explosions justify a revision of the original estimates?

Dr. ROMNEY. I will have to answer the question in two parts, but I can say this: There are many seismologists who feel now, and also felt 10 years ago, that 2 to 1 was inadequate.

Senator HUMPHREY. Too little?

Dr. ROMNEY. Too little, too small.

Senator HUMPHREY. Yes, sir.

Dr. ROMNEY. They would have required more than that. In fact, this was very explicitly stated by a number of people on our panel who evaluated this data.

They said that last year they did not think 2 to 1 was adequate, and this year they still do not, for earthquakes, blasts or any other thing. This is part of the problem.

The guess of 2 to 1 was a borderline guess. This is really the minimum anyone would be willing to work with.

Senator HUMPHREY. Mr. Murphy, do you concur with that?

Mr. MURPHY. I do not have enough information, Senator, to comment.

Dr. ROMNEY. Now, the second thing we found out was that the underground explosions produced a small upward beginning and then a very large rarefaction, and we had not anticipated how much larger that rarefaction was.

If I can illustrate this, I can do it by this seismogram.

What we are looking for is the little upmotion that ought to be in front of the signal. Here is a case that, had we required the first motion to be 2 to 1, we would say, well, this first motion downward is at least twice the noise and, therefore, this is an earthquake.

It was not, in fact, an earthquake. It was Logan, a 5-kiloton explosion.

So this leaves the seismologists very uneasy. They said, "We have got to demand more of our signals. Our signals have to be larger compared with the noise which makes it difficult to determine," and for that reason for this specific kind of problem we have said that 2 to 1 was inadequate. We were cutting it too close to the line; we were cutting off a little muscle.

METHOD OF CALCULATING MAGNITUDE OF RAINIER

Senator HUMPHREY. The Defense Department on January 16, 1959, stated that the earlier estimate of the magnitude of Rainier was too high because it was based on a selection of data from a few stations which typically give larger than average amplitude.

Why was the magnitude of Rainier calculated on data from only a few stations when many stations recorded the shot?

Dr. ROMNEY. Well, the point is this: There were 10 stations—I am sorry, there were 7 stations which picked up the Rainier explosion which had the kind of equipment which could be used to compute magnitude.

The Rainier explosion was picked up at other stations, true, but these did not have the kind of equipment that would be adequate to compute magnitude.

Now, there were some other stations, three specific stations nearby, which perhaps could have or should have picked up Rainier. They did not.

Well, it seemed unreasonable to say that the magnitude of Rainier was the average of the 10 stations, 7 of which have around 4, and 3 of which gave zero.

You see, this would have made the magnitude very low, and this seemed a ridiculous procedure.

The only average is made of the ones where you have data, and this is what was done.

Now, with the experience of the next two large explosions, we found out that those seven stations gave higher than average magnitude, and that the three other stations which gave zero——

Mr. MURPHY. In that respect, there are many factors to consider in computing magnitude. It is not a simple procedure to evaluate magnitude. First, you have to know how your instrument is operating; second, you must know something about the coupling of the instrument to the ground, and the attenuation between that point and the pickup of the recorded shot. It is a rather complex computation.

PROPAGATION OF EARTH WAVES VARIABLE

Senator GORE. I was interested in your statement a moment ago that there were some stations, I believe you said three, that should have given a signal but did not. What do you mean "should have"? Do you mean according to normal calculations of distance and strata? What do you mean?

Dr. ROMNEY. What I mean by that is this, specifically: Other stations with about the same kind of equipment and at about the same distances did get it, but these stations did not.

Senator GORE. What is your explanation for that?

Dr. ROMNEY. The propagation is very variable. You can take a station a hundred miles east of the shot and a station a hundred miles west of the shot, and their amplitude will be quite different.

These stations were just along an unfavorable path; the energy was not propagated well along those paths.

Senator GORE. Is that the result of some faults in the earth or varying formations of the earth?

Dr. ROMNEY. Well, we like to think this is so, but we do not know the specific causes. We think it is something along that line, but we do not know the specific causes.

NO EXCHANGE OF SEISMOGRAPHIC DATA WITH CHINA

Senator GORE. We have had several references here this morning to existing stations. Do we know how many seismographic stations are now installed in China and, if there are any, how much information we exchange with the universities and governmental agencies of China in that regard?

Mr. MURPHY. As a matter of fact, Senator, we have no exchange with China. We receive no data at the present time from China. We do from Hong Kong, and that is the nearest approach. No material is coming in from China proper.

Senator HUMPHREY. We have a policy that excludes that.

Senator GORE. I thought so, but there has been no such discussion

Mr. MURPHY. I would make the additional comment that our exchange with the U.S.S.R. is very good.

They airmail us data within 2 weeks after the earthquakes are recorded in the U.S.S.R.

As a matter of fact, they even gave Antarctic data within 4 weeks after earthquakes were recorded. However, China is not reporting.

SEISMICITY OF CHINA

Senator HUMPHREY. Mr. Murphy, Senator Gore has opened up this whole question on the suspension of tests and its relationship to this great land mass called China, and the efficacy and the adequacy of a control system, if such a system could be installed, exclusive of China.

No. 1, is there evidence as to the number of earthquakes in China?

Mr. MURPHY. Oh, yes; unquestionably. China has a heavy seismicity area.

Senator GORE. It is one of the highly seismic areas of the earth.

Mr. MURPHY. It has seismicity equal to the U.S.S.R. or the United States.

Senator HUMPHREY. With high seismicity, would it be hard to conceal underground tests more readily than in an area where there was no high seismicity?

Mr. MURPHY. The greater the seismicity, the more difficult identification becomes.

INSPECTION CAPABILITY WITHOUT STATIONS IN CHINA

Senator HUMPHREY. Do you feel you could have a reasonably effective system of inspection, detection, and identification without

including inspection apparatus in China? I am speaking now from the scientific and technical point of view.

Mr. MURPHY. Well, it depends upon the range over which you wish to detect.

If it is a very low yield you are interested in detecting, the problem becomes quite serious, because your range for detection becomes much less as your yield decreases.

For larger shots, the chances for detection should be as great as any other part of the world.

Senator HUMPHREY. What do you call a larger shot, Mr. Murphy?

Mr. MURPHY. Since I am not dealing with atomic explosions, and——

Senator HUMPHREY. But it is energy output.

Mr. MURPHY. Energy output, yield.

I had better not make a lower limit in that respect since I am dealing primarily with earthquakes, distribution, and so on.

Senator HUMPHREY. Don't you calculate some energy yield on those, some force yield?

Mr. MURPHY. We work with magnitude.

In that respect, we work with earthquakes of magnitudes probably 5½ and greater. We do not attempt to locate through our own service earthquakes of lower magnitude, first, because we do not have the necessary manpower requirements; second, we are not in position to collect all of the required data. So anything below this magnitude I would not be in a very good position to quote limits for detecting atomic explosions.

NEW DATA AND SHADOW ZONE

Senator HUMPHREY. The Defense Department release of January 16, 1959, stated that:

> It appears from the recent data that first motion is not usable as an identification characteristic of earthquakes which are equivalent to 20 kilotons or less when recorded at distances between 1,100 kilometers and 2,500 kilometers from the burst.

In what respect does this conclusion differ from that reached last summer by the Geneva Conference?

Dr. ROMNEY. We guessed last summer that the first motion would become usable again at a distance of 2,000 kilometers, so this is cutting out signals in the range of 2,000 to 2,500 kilometers.

Senator HUMPHREY. Explain that, please.

Dr. ROMNEY. All right.

Last summer we estimated that signals in the range, say, of 1,000 to 2,000 kilometers would not be usable for first motion purposes.

Senator HUMPHREY. As a result of what kind of an explosion, any size?

Dr. ROMNEY. Any size? Let us say a size of 20 kilotons or a small multiple of that. I cannot be very precise, something of the order of 20 kilotons or smaller.

Now, what we guess now is that instead of 1,000 to 2,000 kilometers being excluded, we should exclude 1,000 to 2,500 kilometers.

Senator HUMPHREY. I see.

LARGER NUMBER OF EARTHQUAKES TO IDENTIFY

The Department of Defense states that—

the annual number of unidentifiable continental earthquakes equivalent to 5 kilotons or larger will be greater than that previously estimated by the Geneva Conference of Experts by a factor of 10 or more.

The Geneva Conference estimated that the number of unidentified continental earthquakes equal to 5 kilotons would be from 20 to 100.

Taking 60 as an average, and assuming no new improvements in the system, the new data would indicate that the number of unidentifiable events might be 600.

Considering both the land area and seismicity of the Soviet Union, about how many of these 600 unidentified events would occur in the Soviet Union; and how many in Communist China.

Dr. ROMNEY. I would like to make a brief comment on that.

The number estimated by the panel of seismologists which reviewed this data was, I think I am correct, 700 to 3,000.

Now, this factor of 10 or more is an approximate factor.

Senator HUMPHREY. Yes, sir.

Dr. ROMNEY. It is more nearly 15, as you can see by these numbers which I have just mentioned.

Now, let me say that of this number, of which we are uncertain, we have estimated that something of the order of one-sixth of these events will occur in China and the U.S.S.R. together. I cannot conveniently break it down any further than that, so you can see from this that the number in the U.S.S.R. and China together is of the order of 100 to 500.

Senator HUMPHREY. Those are 5 kilotons or larger?

Dr. ROMNEY. That is correct.

SIZE OF EARTHQUAKE WHICH CAN BE DETECTED OUTSIDE OF COMMUNIST CHINA

Senator HUMPHREY. Mr. Murphy, you were indicating a while ago that it was possible to calculate magnitude and detect earth movements, and I suppose identify what those earth movements are if the movement was large enough, let us say, in China, even if you did not have a seismographic station right in China; is that correct?

Mr. MURPHY. Yes.

Senator HUMPHREY. How large would such an event have to be?

Mr. MURPHY. Well, that is——

Senator HUMPHREY. Could you detect an event from outside of China if it were equivalent to 5 kilotons?

Mr. MURPHY. No. It would have to be much larger.

Senator HUMPHREY. Twenty kilotons?

Mr. MURPHY. Well, as I said earlier, we can in our normal procedure locate in that area earthquakes which have magnitude 5½ or greater.

Senator HUMPHREY. What do you mean by that: magnitude 5½ or greater?

Mr. MURPHY. A magnitude that is 5½ is more or less equivalent to 20 kilotons.

Dr. ROMNEY. On the basis of the conclusions of the panel of seismologists which considered the new data that would be about a hundred kilotons.

Senator HUMPHREY. About a hundred kilotons?

Dr. ROMNEY. Slightly less. A hundred kilotons would be magnitude 5.6.

Senator HUMPHREY. And that you could identify?

Mr. MURPHY. We could identify a good percentage of those earthquakes of magnitude 5½ or greater, possibly 5½ to 6, with the conventional array of stations at the present time, exclusive of China. [Deleted.]

EFFECT OF EXCLUSION OF COMMUNIST CHINA

Senator HUMPHREY. Is it fair to draw, therefore, from your collective observations here the conclusion that an agreement that did not include the mainland of China, even with the number of stations that are contemplated within the Conference of Experts Report, even with our current system for detection and identification, would leave a gap through which explosions of a very substantial size in Communist China would go unidentified or undetected?

Dr. ROMNEY. Well, Dr. Fisk gave you a start of an answer on this. I think your question was not as elaborate when he gave his answer. I think the answer is that an explosion, a nuclear explosion, of any size could go unidentified in China if we did not have inspection, and that this is indicated in the conclusions of the Conference of Experts, or implied at least, that the only real way to be sure you have a nuclear explosion is to get a sample of radioactive debris, and seismology will never give a sample of debris.

Now, so far as detection itself is concerned, knowing that something happened, then I would accept something close to Mr. Murphy's guess as to what could be done, that we would detect events certainly of 100 kilotons, and I would also say more probably detect events less than 20 kilotons.

Senator HUMPHREY. That is using all our full system?

Dr. ROMNEY. Yes. But this would not—when I say detect now, I do not mean identify as earthquakes. When we start talking about identification——

Senator HUMPHREY. That point on identification has been well made by Senator Hickenlooper and yourself.

Dr. ROMNEY. Somewhere around a 100 kiloton equivalent we would have fairly high assurance that it was an earthquake, if it were indeed an earthquake. Somewhere less than 20 kilotons, we would have fairly high assurance that we knew something happened at such and such a location.

SURFACE WAVES HELPFUL

Senator HUMPHREY. Dr. Press, in his statement, says:

> The main diagnostic information which would be of use in distinguishing between earthquakes and underground explosions is the presence of longer period body waves and surface waves. These events would be separated on the seismograms at distances beyond 1,000 to 5,000 kilometers.

I would like to ask each of you to comment on this.

Dr. FISK. Yes.

Senator HUMPHREY. Was this method used in analyzing the October tests?

Dr. FISK. I would like to defer to Dr. Romney, if I may, sir.

Senator HUMPHREY. Do as you wish, Doctor.

Dr. ROMNEY. Is this in Dr. Press's statement?

Senator HUMPHREY. It is in staff study No. 10, containing the replies of seismologists to the subcommittee questionnaire.

Dr. ROMNEY. Yes, sir. Could you ask your question again, sir?

Senator HUMPHREY. Dr. Press said:

> The main diagnostic information which would be of use in distinguishing between earthquakes and underground explosions is the presence of longer period body waves and surface waves. These events would be separated on the seismograms at distances beyond 1,000 to 5,000 kilometers.

My question was whether this method was used in analyzing the October tests. That can be a yes or no answer. What is your basic comment?

Dr. ROMNEY. Yes; we have looked into this method in connection with the October tests.

There were long-period seismographs operated at a number of stations—a small number, I should say—and these results were studied; yes.

USE OF LONG-PERIOD SEISMOGRAPHS

Senator HUMPHREY. What do you mean by long-period seismographs?

Dr. ROMNEY. Well, we mean seismographs which can record very slow motions of the earth's surface.

These are motions where the earth might rise, fall, and rise again in, say, 20 seconds. It is what we call a long period.

Senator HUMPHREY. What is the purpose of such seismographs in terms of the kind of evaluation that you would make?

Dr. ROMNEY. Well, these particular instruments are for detecting waves which are tracked along the surface of the earth. When we analyze first motion, we are dealing with waves which penetrate through the earth.

Senator HUMPHREY. Yes.

Is not Dr. Press trying to indicate that the surface waves, if properly studied, and if measured by proper instrumentation, can be helpful in distinguishing between explosions and earthquakes?

Dr. ROMNEY. Yes; and it was for this purpose, you see, that we included this kind of equipment in the recommended equipment at the Geneva stations.

Senator HUMPHREY. All right.

Did you use that kind of equipment in the October test evaluations?

Dr. ROMNEY. We made use of what existing equipment there was. We put out only one special instrument of that type, because that is all we could obtain in the time necessary.

Columbia University also put out one special instrument of that type and, I believe, that is all; so there were two special installations, and then existing installations at several places.

ADEQUACY OF CONTROL SYSTEM AGREED UPON AT GENEVA

Senator HUMPHREY. The final question I would like to ask you, Dr. Fisk, is whether you feel that the conclusions arrived at at the Geneva Conference of Experts present a constructive basis for an inspection, detection, and an identification system that could become a part of an agreement on the cessation of nuclear tests?

Dr. FISK. It seems to me that a proper answer to this, sir, is that with the capabilities and with the limitations that we all recognize, as stated in the report, and with the improvements which I think we, many of us, feel are entirely feasible, that the system recommended for study by governments in the meeting last summer could provide a good basis for some kind of an agreement.

ADVISABILITY OF TEST SUSPENSION WITH CONTROL SYSTEM

Senator HUMPHREY. If this system were incorporated into a treaty, with recommendations for further research, and with the supplementary data which would be available from existing facilities, do you feel that such an agreement would be in the national interest and help fulfill the objectives of American foreign policy?

Dr. FISK. To have an agreement on cessation of nuclear testing?

Senator HUMPHREY. Yes.

Dr. FISK. May I answer that in, perhaps, a somewhat oblique way, sir?

It seems to me that where we can find situations in which we would not sacrifice our relative strength, even though we sacrifice our ultimate absolute strength to some extent, that where we can find such situations, it would be to our advantage to adopt them, and this may be such a situation.

APPRECIATION EXPRESSED

Senator HUMPHREY. As a citizen I want to express my thanks to you, Dr. Fisk, and to all of your associates for the labors that you have undertaken, and for the tremendous sacrifice of time and energy in this conference at Geneva, and for the achievements that you were able to obtain.

I think this is heroic service, whatever may come of it, and I am sure you know I personally feel that way not only of you, sir, but of all your associates, regardless of their points of view.

I know that there were differences among some of you, but this was not an easy task.

Dr. FISK. Thank you very much, sir. We had a very powerful American team.

Senator HUMPHREY. Senator Hickenlooper, do you wish to pursue this at this time?

Senator HICKENLOOPER. No.

Senator HUMPHREY. Thank you, Dr. Fisk.

If the rest of you gentlemen would come back at 2 o'clock, we would appreciate it.

(Whereupon, at 12:15 p.m., the committee recessed to reconvene at 2 p.m. of the same day.)

AFTERNOON SESSION

Present: Senators Humphrey (chairman) and Hickenlooper of the subcommittee and Senators Gore, Lausche, Church, and Aiken.

Also present: Carl Romney, USAF; Leonard M. Murphy, Coast and Geodetic Survey; Ronald I. Spiers, Department of State.

Senator AIKEN (presiding). The first witness this afternoon is Mr. Philip Farley, Special Assistant to the Secretary of State for Disarmament and Atomic Energy.

Mr. Farley, will you proceed with your testimony?

STATEMENT OF PHILIP J. FARLEY, SPECIAL ASSISTANT TO THE SECRETARY OF STATE FOR DISARMAMENT AND ATOMIC ENERGY

Mr. FARLEY. Thank you, Mr. Chairman. I have a prepared statement which I would like to review for the committee, if I may.

Senator AIKEN. Would you like to read it?

Mr. FARLEY. I would be perfectly happy to have you interrupt at any time with questions, if you prefer that. If not, I will just go through it.

Senator AIKEN. Very well, please begin. If any of the members have questions, they will interrupt.

Mr. FARLEY. I would hope so because I have assumed we had a presentation earlier for which I think none of you were present, and some of these things are taken for granted, so we would be happy to stop and fill in.

I appreciate the opportunity to appear today before this committee. The negotiations in Geneva for the discontinuance of nuclear weapons tests are of great importance. While the verbatim records of the negotiations are made available to the staff of this committee and members of the committee are advisers on the U.S. delegation, we welcome also such occasions for keeping all members of this committee informed of the progress and prospects of the negotiations, and for hearing their views.

IMPACT OF NEW DATA ON NEGOTIATIONS

Before reviewing the status of the negotiations, I understand that you wish me to comment on the implications for the U.S. position, and for the negotiations themselves, of the new data discussed by Dr. Fisk and Dr. Romney. This new information on the problem of detecting and identifying underground nuclear explosions has not had a significant impact on the negotiations as yet. It bears, of course, only on a limited part of the control system described last summer by the Geneva experts, and prospects are encouraging that ways will be found to maintain the full effectiveness of that system.

There has been an understandable initial Soviet suspicion of U.S. motives in transmitting and subsequently publishing the new data; we need only ask ourselves how we would have reacted had the Soviet Union come up with such new information and proposed reopening the Geneva report. The Soviet Union does not readily grasp the conviction of our Government that it has a responsibility to inform the public of the United States of such important developments, nor does it appreciate the sense of fair play that led us to

bring these data promptly to the attention of the Soviets. When our continuing studies of possible ways of overcoming these technical difficulties have reached the stage when they can be communicated in their turn to the Soviet Union, this may help persuade them of the probity of our intentions.

In the meanwhile, the Soviet Union finds this U.S. action a convenient propaganda weapon to replace the one we have just deprived them of by our recent decision not to insist on a treaty link between disarmament progress and nuclear testing.

Hard facts should in the end persuade the Soviet Union that the problem here is one of direct concern to them also. The Geneva Experts report recognized that only a fraction of seismic events could be identified as earthquakes and that the remaining fraction could be suspected of being underground nuclear explosions and should be subject to on-the-spot inspection. The United States and United Kingdom have tabled proposals, based on the Geneva Experts report, calling for automatic inspection of all such seismic events equivalent to 5 kilotons or more, together with on-the-spot inspection of a significant percentage of such events under 5 kilotons. If the facts are that the fraction of seismic events not identifiable by control posts as earthquakes will be even larger than the number estimated this summer, then the Soviet Union will be faced with the prospect of an increased burden within its territories of the on-the-spot inspections. Realization of these possible implications of the new data may well lead to a change in the Soviet refusal to discuss them. If not, the basis for a sound safeguard system has been laid down in our proposals.

STATUS OF NEGOTIATIONS ON DISCONTINUANCE OF NUCLEAR TESTS

I would like to turn now to the other principal question to which I was asked to address myself, namely, the status of the present negotiations.

The negotiations are now reaching matters of basic importance. While the negotiations to date have moved slowly, the tone has generally been businesslike and the deliberateness of the pace is proper in view of the gravity of the issues involved.

The shifts in the Soviet position have, while numerous, not been significant. The one real change has been their apparent readiness to accept provision for nuclear explosions for peaceful purposes under appropriate restrictions; this does represent a shift from the initial hostile Soviet propaganda line. The other Soviet concessions have no real substance. They could hardly have believed seriously, for example, that their original proposal for a simple treaty leaving the details of the control system for subsequent negotiations would be accepted by the United States and the United Kingdom. Similarly their charges, both in the meeting and in their public statements, that we do not want a lasting treaty should probably be taken not as reflections of real concern but as efforts to apply propaganda pressure. From our point of view what has gone on so far has been to clear out of the way various false issues raised by the Soviet Union. We are now down to the issues of real substance.

These real issues relate to the control system. I would like to ask, Mr. Chairman, that there be inserted in the record the statement

issued by the Department of State on January 24 which summarizes some of these principal problems on which the Soviet attitude must be clarified or changed if there is to be a basis for continuing fruitful negotiations.

Senator AIKEN. Without objection, that will be done.

(The document referred to follows:)

The statement of the Soviet Government released in Moscow on January 22 about the negotiations in Geneva for the discontinuance of tests of nuclear weapons claims that the United States and the United Kingdom are obviously looking for an excuse to torpedo the current Geneva talks. This is not so. The fact that the Soviet Union has chosen this moment, when the negotiations are underway at Geneva on central issues of effective controls, to make such unfounded charges, raises questions as to their intentions.

The basic facts concerning these important negotiations must be clarified.

The key issues have been clearly revealed in the negotiations which have been underway since October 31. These issues relate to the problem of establishing effective control, for without effective control no agreement can be reached or would be meaningful. The Geneva Experts Report of last summer described only the technical features of a control system and did not decide the important political and administrative arrangements which are now under negotiation. Whether the control system is effective or ineffective will depend upon the nature of these arrangements.

These are the major issues:

(1) Will the Soviet Union be able to veto and obstruct every action of the Control Commission, as it now demands, or will it be possible for the control organization to act without this obstacle? The United States believes that any control system which could be frustrated in its day-to-day operations by the veto power in the hands of a single party would be worse than useless.

(2) Will the control posts be manned by an international staff or, as the Soviet demands, by nationals of the government on whose territory the control posts are located, with only one or two outside observers? The Soviet position would amount to self-inspection and as such cannot be the basis for an agreement in which all parties can have confidence.

(3) Will international inspection groups be organized and ready to move quickly to the site of an event which could be suspected of being an explosion? Or will sending of such a group be subject to weeks of debate and a veto? The Soviet approach would entangle this key provision in miles of red tape.

If these and similar key questions can be solved in a way that will insure that the control system is effective, the matter of how long the agreement will last need not be a matter of concern. Indeed on January 19, the United States and the United Kingdom showed clearly their readiness to reach a lasting agreement when they dropped the requirement that any discontinuance of nuclear weapons tests must depend on explicit progress on major disarmament measures. The United States is prepared to conclude an agreement for the indefinite discontinuance of nuclear weapons tests subject only to the satisfactory working of the control system. This certainly is not an unreasonable demand. It is a principle repeatedly endorsed by overwhelming majorities in the U.N.

The Soviet statement attempts to cast doubts on the motivation of the United States in submitting to the Geneva Conference data which resulted from the underground nuclear tests which were held last fall. These data did not invalidate the system agreed upon at Geneva last summer. They did show, however, that it is more difficult than had been believed to distinguish between earthquakes and underground nuclear explosions. Consequently, the system agreed at Geneva, if unadjusted, would result in a burdensome number of on-site inspections, which would be the principal remaining tool to identify possible underground nuclear explosions. The U.S. delegation in Geneva presented these data to the Soviet Union and to the United Kingdom in good faith. In so doing we proposed that they be studied carefully by our respective scientists who would consider how we might overcome the difficulties disclosed by these new data. Our scientists are urgently studying this problem. We expect to be able to transmit their preliminary conclusions to the Soviet scientists in the near future. We believe that these new scientific facts cannot be ignored in the course of the present negotiations, and to have withheld them would have been an act of bad faith.

Success in the negotiations in Geneva is squarely up to the Soviet Union. If the Soviet Union is willing to agree to a control organization that can operate

effectively, it will be possible to achieve agreement on the cessation of nuclear testing.

The United States sincerely seeks such an agreement, convinced that it would be of paramount importance as a first step toward substantial disarmament and toward easing international tensions. For this reason we will persevere in our efforts to bring these negotiations to a successful conclusion. The world is entitled to similar efforts on the part of the Soviet Union.

Mr. FARLEY. In that statement we raised the following three questions:

1. Will the Soviet Union be able to veto and obstruct every action of the Control Commission, as it now demands, or will it be possible for the control organization to act without this obstacle? The United States believes that any control system which could be frustrated in its day-to-day operations by the veto power in the hands of a single party would be worse than useless.

SOVIET POSITION ON VETO

Senator CHURCH. May I ask at this point, Mr. Chairman, whether it is the present position of the Soviet Union in the negotiations that they should have a veto power?

Mr. FARLEY. They have proposed that in the Control Commission, which will have general responsibility for operating the control system, all important decisions should be taken by unanimous vote of the original parties, the United States, the United Kingdom, the U.S.S.R.

Senator CHURCH. That would in effect give a veto power.

Mr. FARLEY. They call that the unanimity principle. We call it a veto power.

Senator CHURCH. They haven't indicated any shift from that position?

Mr. FARLEY. They have in the face of our initial objection to that said that they would be willing to table a list of the kinds of questions—I hope it will be a list that will be inclusive of all the questions—which they consider it imperative that the unanimity principle apply to.

[Deleted.]

Senator AIKEN. What is our present proposal? How long a cessation do we propose?

Mr. FARLEY. Our present proposal in essence is that the agreement should last as long as the control system is installed and is working effectively to show all the parties that everyone is playing according to the initial agreements.

AGREEMENT ABROGATED IN CASE OF VIOLATIONS

Senator AIKEN. Is it correct that the agreement would be abrogated by either side in case of violations?

Mr. FARLEY. That is correct.

Senator AIKEN. How would you prove an earth disturbance was a violation and not a landslide or something?

Mr. FARLEY. That is the basic job of the control system. I did not mean to evade the question. It is obviously much easier in the case of some possible violations than others.

We know pretty well how you would prove whether or not something shot above ground is a nuclear explosion. For things that happen underground, where there is a question whether it is an earthquake or nuclear explosion, the problem is more difficult, and that is

the one that was discussed at some length by technicians this morning, and to which I was referring rather obscurely I know in the first two pages here.

REASONS VETO POWER UNDESIRABLE

Senator CHURCH. I would like to ask one more question. I don't know whether it is possible to give a concise answer to it.

To what degree is it important that the Control Commission operate without a veto? How much power is going to be vested in the Control Commission, and how much of the control system is going to be particularized in the treaty itself?

Mr. FARLEY. I could really best do it in the case of one example, summarizing it pretty well.

We all recognize that this problem of the seismic events that might be earthquakes and might be underground explosions is a most difficult one to deal with.

Our proposal is, as I have indicated here, that the control organization have the clear authority, whenever there is technical evidence which would show something has happened which could be a nuclear explosion, to send a team to that spot, not all over the map, but to that spot as it is vectored in on by control posts, to see whether or not there was a nuclear explosion.

The Soviet Union says that should only be done after all possible other kinds of evidence have been collected, have been referred to the formal governing body, the Control Commission, and that body has decided by unanimous vote that there should be an inspection team.

We think this is a very clear illustration of where the veto would make the whole system inoperable.

Senator CHURCH. This is a kind of authority which could only be vested in a commission?

Mr. FARLEY. Our proposal would be that the administrator would be responsible for sending out—the Control Commission is the equivalent of the board ofdirectors, and the administrator is like an executive vice-president—our proposal is that the administrator has the responsibility of sending out an inspection team whenever the technical criteria are met which show that there is something which can reasonably be suspected of being a nuclear explosion, unless he is ordered not to.

SOVIET POSITION ON VETO

Senator LAUSCHE. Have the Soviets given any reason why they demand that all avenues of investigation be exhausted and the on-the-spot team not be sent in until there is unanimous approval by the commission?

Mr. FARLEY. There are two kinds of reasons.

Senator LAUSCHE. Let me hear them.

Mr. FARLEY. The first kind of reason grows out of their attitude toward a control system. They say in general, "If you and we sign a treaty like this, nobody is going to violate it. We trust each other. We trust you and we know we are not going to shoot off any explosions, but we want this agreement so badly that since you and the British are insisting on having a control system, we will agree to one.

"But let's not go too far with the thing. Let's always look at each individual case reasonably. In this particular case why sure there are

going to be earthquakes, but if you get all the data from all the seismic stations which are already in existence around the world, if you talk to people and read the newspapers, look at all this, you will know there wasn't any nuclear explosion. You aren't going to need to send an inspection team in most cases."

The second kind of reason is that if you get to the situation where they are forced to admit that it might make sense, then they say, "Even so, sending an inspection team is a very important invasion of national sovereignty. We agree that it might be necessary, but we want to have a look at each case before anyone goes in, because this is a grave matter of national security, and we want to be sure that in each case before anyone goes in, they are satisfied there is a good reason for it."

Senator LAUSCHE. What answer have we given to the second reason that they have propounded?

Mr. FARLEY. It is basically the reason, Senator, that if you are going to have an international control system, then it must be able to function without the veto by the very people being supervised, or its whole purpose is lost.

If a suspected violator can say whether or not he is going to be checked up on, why then you haven't got much use for a police force. No one is going to start the checking.

Senator HUMPHREY. (now presiding). In reference to the first alleged reason for the Soviet insistence on a veto, or the unanimity of the Commission, it is our intention, is it not, to exhaust most all of the facilities that we would have prior to on-the-spot inspection? On this point there is some agreement, I believe. Do you see what I mean?

Mr. FARLEY. Yes. We certainly agree that one should apply a rule of reason here. On the other hand, the expert advice which we have, which is persuasive to me, is that in the cases where there is a real possibility, and you can do some categorizing here, time may be important, and it is probably going to be necessary to get your machinery underway, or you could not even organize and transport a team in time to do the job.

[Deleted.]

Senator LAUSCHE. Then it would really mean that under the pretense of protecting national sovereignty, at all times, regardless of the gravity of the situation, they could invoke that as a reason for vetoing the visit of the inspection team.

Mr. FARLEY. Right; that's right.

Senator HUMPHREY. And we consider this unacceptable?

Mr. FARLEY. We consider this unacceptable.

Senator CHURCH. It would seem to be eminently sound.

Mr. FARLEY. Well, as I go on to say here in a self-serving way, we think that this would be generally supported.

Shall I continue?

Senator HUMPHREY. Please go ahead.

STAFF OF CONTROL SYSTEM

Mr. FARLEY. I might say, Mr. Chairman, that I was running through a prepared statement and had been in the course of running through what we consider are the essential issues.

2. Will the control posts be manned by an international staff or, as the Soviet demands, by nationals of the government on whose territory

the control posts are located, with only one or two outside observers?

I might say parenthetically that the Soviets yesterday said that they had made a great concession by upping that to four or five outside observers. We think the differences in number there is trivial, that the important thing is the principle, who the operating people are.

The Soviet position would amount to self-inspection and as such cannot be the basis for an agreement in which all parties can have confidence.

READINESS OF INSPECTION TEAMS

3. Will international inspection groups be organized and ready to move quickly to the site of an event which could be suspected of being an explosion? Or will sending of such a group be subject to weeks of debate and a veto? The Soviet approach would entangle this key provision in miles of redtape.

Issues such as these are fundamental to the effective working of a control system and to the meaningfulness of any nuclear test suspension agreement.

ISSUES HAVE BEEN DEFINED BY BOTH SIDES

Senator LAUSCHE. Are the issues as they actually exist as simple in definition as they have been set forth in these three paragraphs?

Mr. FARLEY. They are becoming this simple. For example, the Soviet Government issued a published statement, I believe it was last Thursday, and we issued one from which I have been quoting here on Saturday which has tended to help define the issues.

On the other hand, in any negotiation what you try to do is define the issues in the way most favorable to you. The Russians are certainly trying to do the same on the other side.

They are saying that the issues are the ones Senator Aiken referred to: Is the United States willing to enter into a lasting and stable agreement?

We have been trying to make clear, both publicly and in our dealings with them, that we are also trying to achieve a lasting agreement, so long as it has the stability that comes from an effective control system.

Senator LAUSCHE. It is our position, however, that an impartial bystander, knowing the facts, could come to the conclusion that the issues as defined in these identified paragraphs, 1, 2 and 3, are the real issues.

Mr. FARLEY. This is our belief. We believe it for a number of reasons. Among others that these really are the political requirements that must underlie the kind of technical control system that the experts agreed on, experts from both sides of the Iron Curtain this summer.

It is really very difficult, we think, to justify all this elaborate machinery of control posts and technical equipment and all the rest of it in Russia if you then man it with Russians. You might just as well ask the Russian Government whether it was testing.

In addition, there is a long background of useful argument and debate on this subject in the United Nations in the past years. In general, while I know the U.S. position has not always been supported on every aspect of disarmament objectives, I think our position has increasingly been supported very widely on the point that there must be effective control of any disarmament agreement that would be in

the interests of both sides and the neutrals, and these are the kinds of principles of effective control that have developed out of a great deal of debate and argument.

INSPECTION WOULD BE RECIPROCAL

Senator LAUSCHE. I suppose it has been said by our representatives, "We are willing to allow these inspection teams to come into the United States, and if we are willing to allow them to come in, why don't you allow them to come into your country?"

What do they answer to that?

Mr. FARLEY. Reciprocity is of course a major point we make, that anything we talk of we are confident that the Senate of the United States will confirm, that it is something the United States will do.

The Soviet objection is put in a number of different ways. For example, they say it is well known the United States is interested in espionage, and desires to have nonnationals of the Soviet Union to come in just to pry around. There are a lot of points like that. I don't know that I can pick any one as the principal argument they use.

Mr. SPIERS. I think that they give the analog. They say, "If we are willing to trust you to man your own inspection teams, you should be willing to trust us to do the same."

POSSIBILITY OF NEUTRAL CHAIRMAN

Senator HUMPHREY. Have you contemplated the possibility of both parties agreeing upon a neutral chairman of the inspection team?

Mr. FARLEY. [Deleted.] We see some difficulties for a number of practical reasons.

[Deleted.]

Senator HUMPHREY. Please proceed.

Mr. FARLEY. These issues are crucial not only to the present negotiation but to any subsequent disarmament negotiations. If we compromised here on these principles, we would undermine not only this control system but the prospects for sound broader disarmament agreements of the sort which we hope will grow out of success in these negotiations and which indeed are the major justification for the present negotiations. We thus have a double reason for standing firm on these principles. Our position in this regard is, we believe, understood and broadly supported in the United Nations and throughout the world.

U.S. OBJECTIVES

Before commenting on the likelihood that a sound agreement will be reached on these difficult issues, I want to reaffirm that our objective is to achieve agreement on a treaty suspending nuclear weapons tests if provisions safeguarding the interests of the United States and of all parties to the treaty can be negotiated.

An effectively safeguarded treaty would be in the interests of the United States for a number of reasons. A fundamental objective of the U.S. policy is the achievement of safeguarded arrangements for the control and reduction of armaments. Any meaningful agreements on disarmament, however, must contain provisions for effective controls. In recent years negotiations have been unproductive because of the unwillingness of the Soviet Union to agree to this basic requisite.

PROBING OF SOVIET INTENTIONS

In the present negotiations for discontinuance of nuclear weapons tests, we are probing once again the Soviet attitude on this crucial aspect of any agreement. If an effective control system covering the relatively simple problem of nuclear weapons testing can now be negotiated and subsequently be brought into actual operation, prospects for successful negotiations in other fields of arms control and reduction will be markedly improved.

If, on the other hand, the Soviet Union, when faced with the need to undertake firm commitments for control posts and inspection teams inside the Soviet Union, shies away from such commitments, their pretentions to a serious interest in arms control will lose their plausibility.

If the Soviet Union agrees to a control scheme of the sort outlined by the agreed report of the Geneva Experts, the significance will obviously extend beyond the enhanced prospects for fruitful disarmament negotiations.

Senator HUMPHREY. Did the Geneva Conference of Experts conclusions embody this binational type of inspection team?

Mr. FARLEY. The political organizational principles?

Senator HUMPHREY. Yes.

Mr. FARLEY. In general they were not laid down in the Experts report. We tried conscientiously to narrow the field of discussion there to what was appropriate for technical people and what we thought could be done in one bite. We are moving beyond that now.

SOVIET POSITION ON STAFFING OF INSPECTION TEAMS

Senator HUMPHREY. In other words, when the report talked about inspection teams, it did not say that in the United States the team should be part Russian and part American, and in the Soviet Union that it should be part American and part Russian?

Mr. FARLEY. Is there anything in the record on this, Mr. Spiers?

Mr. SPIERS. No; there is not. The only possible departure from this principle of avoiding any statements relating to the organizational political and administrative aspects of this system was what it said about aircraft, which just was a matter of stating that it would be sufficient on technical grounds to use aircraft belonging to the country being overflown, if this were desired.

Senator HUMPHREY. I spoke about this at great length with Mr. Khrushchev. We went over many of these points under discussion.

At one point I asked him whether or not he was prepared to accept the Conference of Experts Report. I said that we wanted the agreement, but we wanted an agreement which was meaningful, one in which there was no veto right, and one in which there was an adequate inspection system, included in one document.

He replied affirmatively, and repeatedly, that he was prepared to include in one treaty the complete system that was agreed upon by the Conference of Experts. I have actual quotes on what he said he would do. There were other items of technical detail, on such matters as peaceful explosions.

I wondered whether the agreement of the Geneva Conference of Experts, on the basis of background discussions, encompassed this

matter of inspection teams of nationals of the Soviet Union, the United States, and the United Kingdom combined.

Mr. SPIERS. The Russians tried to get us to discuss this subject at Geneva, and they did put forth their own views, which are substantially the views that are being put forward in the current negotiations.

They did say, or they did try to get our people to go along with a section in the report which would decide this question for all practical purposes to the effect—as a matter of fact I recall their asking us, "Do you agree that this can be done by nationals of the country on whose territory the posts are located, or do you think it would be required to have some outside observers?" And we just said that our people are not here to discuss this aspect of the problem.

Senator LAUSCHE. Then there is a direct conflict between what Krushchev says and what you say. Your statement says:

> If the Soviet Union agrees to a control scheme outlined by the agreed report of the Geneva Experts, the significance will obviously extend beyond the enhanced prospects for fruitful disarmament negotiations.

Senator Humphrey states that Khrushchev made the statement that he is willing to go along with the body of conclusions of the Geneva experts.

Senator HUMPHREY. But as Mr. Farley is stating, that does not include the matter of having U.S. experts on an inspection team in the Soviet Union, and Soviet experts on an inspection team in the United States and the United Kingdom.

Mr. FARLEY. I am afraid that my sentence there taken alone, Senator, is misleading.

I meant it to follow on directly from the preceding sentence where I brought in the political commitments which we think are necessary to make this work, the control posts which are manned by a genuinely impartial staff, and so forth. I am afraid I did not spell out those additional considerations.

METHOD OF CHOOSING INSPECTION PERSONNEL

Senator LAUSCHE. Have we made any proposal about how these representatives on the inspection teams shall be chosen?

Mr. FARLEY. We have made fairly detailed proposals which reflect technical problems of getting good people as well as the political considerations of having a method of insuring that this will be a really effective operation of control posts.

We believe that it should be the responsibility of the administrator, the executive vice president of the control system, to select and organize the teams. He would be provided with only general guiding principles, but we do believe certain general principles are important.

[Deleted.]

EFFECT OF NEW DATA ON NEGOTIATIONS

Senator CHURCH. Mr. Farley, I have one question that is of concern to me. It relates back to an earlier point. The present negotiations are based upon the technical recommendations that were made by the Geneva Experts. These have constituted the ground rules, so to speak, have they not, for the present negotiations? They

have been the crucible in which the present negotiations on political aspects are taking place?

Mr. FARLEY. They are the expert conclusions on which we are trying to build an agreement.

Senator CHURCH. Since the experts recommendations were made, we have found reason to believe that those recommendations are no longer sufficient, and we have suggested that changes may have to be made in the light of the new experiments.

The impact that this has had on the present negotiations must be considerable. My question is, How are you handling this dilemma? It is like rowing in one boat and then suddenly being out of the boat and trying to row without another boat.

How do you deal with this?

Mr. FARLEY. Let me describe what I think, as a political man, we got from the experts.

We got really two things. We got a general system which was intended to be adequate and comprehensive for the control job in accordance with the principles laid down, and we also got a lot of factual estimates about what on the basis of the data the experts had this last summer would be the way this would work.

When you come to the particular case upon which we have had new data, you have to distinguish between the basic principle they laid down and the factual estimates they made. The principle they laid down was that it was going to be difficult to distinguish between earthquakes and possible underground nuclear explosions, that only in a fraction of the cases could you tell by just looking at your technical equipment and its results in a post that something was an earthquake and not an underground explosion.

In the remainder of the cases, you would have to go and look. That was the basic principle.

Now the experts then said, having worked out this principle and having gotten it agreed to, that on the basis of the data they had last summer, they thought that just by sitting in the control posts and looking at the equipment they could tell in 90 percent of the cases or so in the range from about 5 kilotons that it was an earthquake. You would not have to go and look.

New data has tended to suggest that their percentage is considerably too high, that the number of cases where you would have to go look is greater.

[Deleted.]

This is an accepted situation, however, if we are prepared to do one of two things: Take the burden of the additional inspections or find ways, and persuade the Russians to agree to install them, to strengthen the original technical equipment and other characteristics of the system.

We think these are two reasonable possibilities. So while it is a problem, it is a problem relating to only part of the system. It is one on which the best technical advice we get is that you can recoup this technical difficulty by the kinds of improvements that will not involve having more than 180 manned stations, which is the really sensitive part.

We think therefore that we have an adequate basis for continuing on our present line.

36042—59—pt. 1——4

Senator HUMPHREY. A great political principle is involved because onsite inspection would mean a piercing of that monolithic disciplined society with some degree of freedom of movement.

(The following discussion was classified. Questions discussed were: (1) Sharing of the cost of the inspection system and improvements; (2) possible Soviet actions in view of new data.)

GREATER NEED FOR INCLUSION OF COMMUNIST CHINA

Senator GORE. I think the burden of the testimony this morning would indicate that the new data which, as you say, indicate the requirement for improved instrumentation and more inspections, will also indicate the greater necessity, if this inspection system is to be adequate, for the inclusion of Communist China in the system. Of the 180 stations recommended by the experts, approximately 20 were recommended for installation in the Soviet Union and approximately that same number for installation in China.

What is the program of the State Department with respect to inspections in Communist China?

Mr. FARLEY. The objective toward which we are working is a world-wide control system.

(Further discussion deleted. It concerned the question whether control stations are needed in Communist China and the possibility of nuclear explosions in China.)

Senator GORE. Is there any reason to presume that relationships between the two Communist countries are now so strained, or may become so strained, that in the event the Soviet Union wanted singly or jointly to conduct underground tests in Communist China, such an accommodation would be impossible.

Mr. FARLEY. The answer is "No."

(Further discussion deleted. The question was raised whether the Soviet Union would help Communist China develop a nuclear capability.)

Senator GORE. I think we are pleased to contemplate seeds of friction between the Soviet Union and Communist China and perhaps do a little wishful thinking about it.

However, substantially all our information seems to support the conclusion of a close collaboration between the two countries.

COLLABORATION BETWEEN SOVIET UNION AND COMMUNIST CHINA

Senator LAUSCHE. May I interrupt at this time just for the purpose of the record?

From the evidence I have heard, the conclusion that I would have to reach is that there is full cooperation between China and Russia at present, and that the statements of the commentators and the columnists that there is a division is not supported by the evidence.

(Discussion deleted. Questions discussed were:

(1) Possibility of nuclear tests in Communist China, with or without Soviet assistance.

(2) Possibility of detecting tests in Communist China without inspection stations in Communist China.

(3) Feasibility of bringing Communist China into the agreement.

(4) Methods of safeguarding our interests as long as China is not a part of the agreement.

(5) U.S. policy in event a nuclear explosion occurred which could not be blamed on the Soviet Union.

Mr. FARLEY. I agree that it is always going to be possible that an underground shot might be conducted without being detected. It is very unlikely that anyone could achieve a significant new nuclear capability or a significant improvement of his existing capability without being clearly and publicly in the position of having violated or otherwise evaded the agreement.

Senator HICKENLOOPER. I wish I could share a small part of your optimism on that point.

Mr. FARLEY. I think, Senator, this is one of the points on which we have to persuade you, if we are to expect a treaty to be ratified.

DIFFICULTY OF PROVING VIOLATION

Senator HICKENLOOPER. We discussed this problem this morning in a small degree. How are you going to tell? Now, a contract between two individuals, a written contract, is utterly unnecessary if each individual is going to meticulously live up to the terms that he has agreed upon with the other fellow. But we have written agreements to protect against either misunderstanding or evasion. Contracts are set up to avoid this.

We are talking about detection. I want to repeat that it is my understanding, from having sat through many of these meetings, not only of this committee but of others, that tremors can be detected but it is not possible to distinguish whether they are atomic explosions or earthquakes in a very substantial number of instances.

You said a moment ago that the only way to ascertain their nature is by on-the-spot inspection.

If there is a determination, let us say, on the part of the Soviet Union to conceal a shot of anything from 5 kilotons up, perhaps you can look at seismograph records and say that signal has a lot of characteristics of an explosion, but it also has characteristics of an earthquake. We don't know, we must inspect the site.

Where are you going to look? Everybody agrees you can determine the site from any substantial distance within a space of a minimum of approximately 5 square miles. Some estimates are 10 square miles, depending on many factors. Nevertheless, within that area, where are you going to look?

Suppose there is a deliberate attempt to violate the agreement and conceal a test. It would take ages to drill holes throughout the area. We have already found out that even knowing exactly where an underground explosion is, it is difficult to hit it with a drilling rig.

On Rainier we tried two or three times, and we missed the spot, even though we knew exactly within an inch where the shot had been fired.

The variations of the substructure send the drilling rig off.

How is on-the-site inspection going to prove anything against a real determined effort to conceal a test?

We are perfectly aware that the Soviet Union has violated understandings and agreements that it has had. These are the problems.

I am thoroughly in sympathy with the efforts, but I don't want us to get caught in an unfair trade, and that is the thing which has con-

cerned me over the months; I, like Senator Gore, was at the Geneva meeting for a week.

If the Soviet Union is ever going to agree on anything that is realistic and workable, then I will be very surprised.

Mr. FARLEY. I might just comment briefly on the main point you were making.

Senator HICKENLOOPER. Yes.

METHODS OF PROVING NUCLEAR EXPLOSION

Mr. FARLEY. Certainly the problem of clearing up what the suspicious events are is a difficult one.

In the case of the large explosions, you, of course, assume we will have or would have nuclear debris as well as the wiggles on the seismograph.

Senator HICKENLOOPER. There is nuclear debris in any kind of a nuclear explosion.

Mr. FARLEY. Nuclear debris in the atmosphere.

Senator HICKENLOOPER. I am talking about underground explosions.

Mr. FARLEY. Well, I am sorry, I thought you had indicated that this could go up into the larger ranges, and——

Senator HICKENLOOPER. I am talking about underground ones.

[Deleted.]

Mr. FARLEY. While it may be that in the very small explosions you will have kind of practical difficulty finding the thing which you mentioned, which is certainly a reality now, I would say on the other side that this matter, too, is one in which not as much positive thought and study has been given as will have been by the time we carry this through, so that I think the possibilities for improving on-the-spot inspection techniques are good also.

So you have the three cases: There is a very real possibility that a major-sized underground explosion will actually put debris in the atmosphere; there is the second case that in the intermediate range at least you will have not just interested people, but objective international staffs, saying that by all the agreed criteria this is evasion, or an attempted violation going on, unless you can actually prove on the spot it wasn't; and finally, the final point——

Senator HICKENLOOPER. How are you going to prove on the spot that an event was not a nuclear explosion?

Mr. FARLEY. What?

Senator HICKENLOOPER. How are you going to prove that it was or was not an explosion?

(Discussion deleted. It concerned the assessment of the risk involved in agreement which did not include Communist China.)

Senator GORE. A few tests are what concern me, not one. One may be important. In some cases one was particularly important to us. However, a few might be extremely important to the development of nuclear capability, particularly when the range of missiles may be affected by the weight of the warhead.

(Discussion deleted. The discussion centered on choices involved in entering an agreement to suspend tests and policy in regard to Communist China.)

Senator GORE. Well, Senator, there are several alternatives. That certainly is one of them if we are able to reach agreement with the Soviet Union.

I would like to briefly state that I came to the conclusion that the Soviet Union was not going to accept, even within her own borders, an adequate inspection system. They are still insisting that it is not necessary, that it is only a matter of having confidence in each other. Secondly, even if they did accept an adequate inspection system, they might be laughing up their sleeves at us, because they could continue to test in Communist China when we were unable to install any control points there. Therefore, I made the suggestion that we start with something that is achievable and workable and stop the atmospheric tests which now can be reasonably controlled, and then hope, and I mean genuinely hope, that eventually we could develop some system for controlling and identifying and detecting underground tests.

That will give you a brief answer.

Senator HUMPHREY. Can we finish your statement and then come back to some further questions? Do you have any more on your statement?

SIGNIFICANCE OF AGREEMENT ON TESTS

Mr. FARLEY. An important shift would have taken place in the Soviet approach to relations with the free world. However small the chances that this shift has indeed taken place, we are determined to leave no possibilities unexplored.

In addition to the broader significance of a nuclear test agreement a suspension of nuclear tests would itself be advantageous. No other single step would do as much to halt the spread of nuclear weapons to an ever-increasing number of countries. The fears of radiation hazard, exaggerated though they may be, have been real in many parts of the world and a great sense of relief would follow a test suspension. This in itself would be helpful to the United States, which has borne the brunt of opposition to nuclear testing because of the openness of its policy on informing the world of its testing activities.

FUTURE PROSPECTS

If the Soviet Union like ourselves is genuinely interested in reaching a sound agreement, then the outcome of the negotiations will depend on the Soviet attitude toward effective control. Other issues, however difficult they may be to work out, appear at this point to be negotiable. If, however, the Soviet Union will not accept adequate provisions for the safeguarding of a test suspension, we cannot in our own interests enter into a treaty.

The negotiations so far have moved, though slowly, toward a favorable conclusion. Even before the present meeting, the Soviet acceptance of the principles of effective control set forth in the Geneva Experts Report was a recognition of the validity of the basic U.S. approach to disarmament. A framework is also provided for demonstrating the weakness of present Soviet demands for self-inspection and for a veto on the operation of a control system. Clearly such political loopholes would make the whole control system, which the

Soviet Union itself endorsed, a meaningless and cruel delusion. The principles of majority rule and international staffing proposed by the United States and the United Kingdom are on the other hand the logical and simple political requirements for the effective operation of the jointly agreed technical system. Soviet rejection of them would be a clearcut example of inconsistency and political maneuver.

Prediction as to the outcome of the negotiations is impossible at the present time. The novelty and technical complexity of the problems which must be solved, against the long record of frustration in disarmament negotiations, warns us not to be optimistic. There are however, sufficient signs of underlying interest on the part of the Soviet Union to make it essential that we explore every possibility for sound agreement, and for progress in this one area toward our goal of a world of international peace and order.

MORE INFORMATION NEEDED ON EFFECTS OF EXCLUDING COMMUNIST CHINA

Senator HUMPHREY. I think Senator Gore's interrogation of you in reference to Communist China is very significant. [Deleted.]

We brought this problem up 2 years ago and at that time the response was to the effect that it would be better if we didn't talk about it now.

My feeling is that this poses one of the most serious problems before our Government. Every time we start to negotiate about a world security system, or any worldwide problem, we pretend that one of the major powers in the world is not Communist China. Today, whether we like it or not, Communist China is a major power and may be the greatest menace to peace in the world.

I happen to think Communist China seems to be a little more irresponsible than the Russians. It is a very serious matter to even talk about treaties, alliances, disarmament or any kind of negotiations without facing up to this very complex political problem.

Yet we are unwilling to talk about the problem.

I now have some questions on specific matters.

RELEASE OF DATA BY DEFENSE DEPARTMENT

Why was the detailed data from the Hardtack series released on January 16 by the Department of Defense, when the original panel and statement were the responsibility of the President's Science Advisory Committee, and it was the Department of State that was responsible for the handling of the Geneva negotiations?

Mr. FARLEY. I think the accurate way to state it is that we, in the Department of State, requested them to release it. You might say that in general we believed, and all the agencies in the executive branch believed, that the information should be made public. But it was always the intention to release it.

[Deleted]

INTERPRETATION OF NEW DATA

Senator HUMPHREY. Why was no attempt made by those responsible for releasing this new data to really explain its significance?

I mention that because the layman must rely upon the newspapers. Someone at the copy desk has to rewrite this technical data so that laymen can understand what it is about.

It is a rather hazardous pursuit, by the way.

Mr. FARLEY. I am afraid my only answer is that the way we try normally to do that is in the preparation of the release itself.

Senator HUMPHREY. Do not misunderstand me, I think the release was accurate, but it was so technical. The reliance for the explanation was entirely upon the individual newspaper and the individual copy desk man.

Mr. FARLEY. This is, to some extent, a special case in that we released data because of negotiating and other urgencies and before its full implications were known.

I think it is true that the implications that were inferred by most of the newspapers went in one direction. [Deleted.]

It was an awkward situation because it was, in effect, technical data whose meaning was not fully understood.

Senator HUMPHREY. Well what is the present thinking of the State Department regarding the seriousness of the Soviet Union in seeking a control ban on nuclear weapons tests? Do you think they are sincerely pursuing it or are they going through exercises?

[Answer deleted.]

REPLIES OF STATE DEPARTMENT TO QUESTIONS OF SUBCOMMITTEE

Senator HUMPHREY. The State Department answered a number of questions that were raised by the subcommittee in an inquiry that we submitted regarding arms control measures.

Since these questions were answered in a nonclassified form, would the Department have any objection to having these appended to the present hearing when it is released?

Mr. FARLEY. It was our effort to prepare these in an unclassified form you could use in any manner you wished.

Senator HUMPHREY. We just wanted to make certain as we would not want to violate any understanding.[1]

QUESTION OF NECESSITY OF FURTHER TESTS

Many opponents of the test ban argue that further tests are needed to develop smaller weapons or clean nuclear weapons.

There does not appear, however, to be much evidence that the Defense Department has been much impressed with the need of these weapons beyond what is already being developed and produced.

I would like to ask if we are asked to continue testing weapons in areas in which the Defense Department itself has demonstrated no keen interest?

Mr. FARLEY. I am afraid, Senator, I am not in very good position to answer this. I am not, in general, privy to advance Defense Department weapons requirements.

I can only make the general observation that in reaching the executive branch decision as to our intent to go into this negotiation, these weapons requirements and the present achievements, were balanced as against the Russian requirements and achievements, and balancing those against each other and setting them off against the many other

[1] See appendix at end of pt. 2 of hearings.

political considerations, we felt we had more to gain from an effectively safeguarded test suspension than from a continuing competition in weapons development, taking into account where we stand, what marginal improvements we could still make, or what substantial improvements.

On that specific question I cannot really give testimony.

Senator HUMPHREY. That is a very sensible and, I would say, constructive answer.

What you are saying is that these things were all considered and weighed in conferences within the executive branch of the Government before the policy decision was made relating to the present Geneva discussions; is that correct?

Mr. FARLEY. That is correct.

Senator HUMPHREY. It seems to me that is a satisfactory answer.

Senator HICKENLOOPER. Mr. Chairman, just because a record is being made up here, I will have to say that I do not have any evidence whatsoever that the Defense Department is happy with the cessation of the tests. The Defense Department considers that there are vast areas in which many believe that knowledge vital for the national security could be obtained from various future tests. I do not know of any responsible military people who are happy over this matter from the standpoint of the military. It is like a battleship admiral, he never has too many battleships. He wants more.

Senator HUMPHREY. Of course.

Senator HICKENLOOPER. My impression is that the military are not enthusiastic about the stopping of tests.

Senator HUMPHREY. I did not understand Mr. Farley's answer to indicate that they were. However, from an overall policy review the decision was arrived at in favor of the negotiations.

Senator HICKENLOOPER. I was not disputing Mr. Farley's statement. I think his statement is accurate.

Senator HUMPHREY. I understand.

Senator HICKENLOOPER. However, I was taking a little issue with what I understood to be the premise of your question, and that was apparently that the military were satisfied with the status quo of nuclear weapons, and that they thought it would be all right to stop tests.

Senator HUMPHREY. My point was, and I think the record will bear me out, that the military has not shown any great desire for clean weapons. They have just shown a desire for weapons which do the necessary job.

Secondly, from the testimony that we have had in the past, it appears that there has been more emphasis placed on the big weapons than on the smaller weapons.

I do not say there was not emphasis placed on the small weapons but more emphasis was placed on the big. Since the opponents of the test ban say that what we need are more tests for small weapons and more tests for clean weapons, I was only saying that the Department of Defense has not necessarily stressed those two factors.

They have stressed the desirability of more weapons, there is no doubt about that, and better weapons, but maybe not more of the smaller and more of the so-called cleaner weapons. We have discussed that at length.

[Deleted. Questions concerned parties to the test-suspension agreement and policy on proposals for a limited test suspension.]

WORLD OPINION

Senator HICKENLOOPER. Mr. Chairman, I think while we should be sensitive to what is called world public opinion and we should attempt to be moral under all circumstances consistent with the basic security of this country, nevertheless it seems that every time we make a great sacrifice, we do not get much credit for it in world public opinion.

They say, "That is what the United States ought to do."

However, every time the Soviet Union stops doing something it never should have been doing in the first place, they say, "Look at what humanitarians the Russians are."

If the Soviet leaders stop doing some criminal acts which they should have stopped doing anyway under the world code, they seem to get a lot of credit for it, whereas all world opinion says about us is "that is what they should have done anyway." I do not know just what we can do except to do what we think is right and hope for the best.

Senator HUMPHREY. That is right.

The technical experts who appeared this morning are here. I did not gather out of Mr. Farley's remarks anything on the technical aspects which was not discussed this morning.

I believe that would be your view, isn't that right, Mr. Murphy?

Mr. MURPHY. That is right.

Senator HUMPHREY. Do you have any observations you would like to make in reference to any of this testimony of Mr. Farley's, Dr. Romney?

Dr. ROMNEY. I am no more an expert in his field than he is in mine, and I think we should leave it that way.

Senator HUMPHREY. We shall then consider this portion of the meeting closed.

STATEMENT SUBMITTED BY DR. FRANK PRESS, DIRECTOR OF THE SEISMOLOGICAL LABORATORY OF THE CALIFORNIA INSTITUTE OF TECHNOLOGY

CALIFORNIA INSTITUTE OF TECHNOLOGY,
DIVISION OF THE GEOLOGICAL SCIENCES,
SEISMOLOGICAL LABORATORY,
Pasadena, January 22, 1959.

Hon. HUBERT H. HUMPHREY,
U.S. Senate, Washington, D.C.

MY DEAR SENATOR HUMPHREY: I am unable to testify before the Senate Foreign Relations Subcommittee on Disarmanent on January 28, because of prior commitments. I should like to take advantage of your suggestion that I submit a written statement of my views if I could not appear personally. I enclose a statement with this letter.

I have admired the work of your committee on this subject, and I should be very happy to help you in any way I can.

Sincerely yours,

FRANK PRESS, *Director.*

(STATEMENT ON THE SEISMIC DETECTION PROBLEM)

(By Frank Press, California Institute of Technology, Pasadena, Calif.)

Seismic waves are the only known manifestation of a distant subsurface nuclear explosion. The seismic method of detection makes use of signals recorded at a number of monitoring stations to locate the source, and to discriminate between earthquakes and explosions as sources. In order to locate a seismic disturbance, one must observe the times of arrival of the initial signal at a number of stations varying in azimuth from the source. Identification is more difficult than location since a less definite parameter than arrival time must be determined from the

records. The Geneva-type monitoring system relies principally on the direction of initial motion in the seismic signal as an indication of the nature of the source. Explosions produce initial compressions (upward ground motion), whereas earthquakes are usually characterized by equal distribution of compressions and rarefactions (downward ground motion). In order to gage the capability of a network of monitoring stations, one must have the following empirically determined information:

1. Dependence of seismic wave amplitude on yield.
2. Amplitude variation with distance.
3. Level of microseismic background—the noise above which the seismic signal must be detected.

At the time of the Geneva Conference of Experts, limited information from a single underground nuclear explosion was available. None recognized more than the participants that the Geneva conclusions were based on scanty data and were subject to much uncertainty. Scientists are familiar with the procedure whereby a conclusion is stated and qualified by a description of the uncertainty involved. By providing more data points to determine microseism level and initial signal amplitude dependence on yield and distance, the Hardtack II tests narrowed the uncertainty somewhat and demonstrated that the identification capability of initial motion should be reduced. Since the Geneva system relies almost entirely on first motion, a reduction in its estimated capability was required. The uncertainty is still great and can be narrowed further only by additional underground tests, especially in environments different from that of the Rainier-Hardtack II explosions. It should be pointed out that the seismographs used in the Hardtack II tests were inferior to those prescribed by the Geneva experts. However, allowance was made for this in evaluating the data.

Within this broad spectrum of uncertainty, the position which one takes may reasonably depend on factors other than the data immediately at hand. For example, very little research has been conducted on the identification problem. An assessment of the possibilities of research based on results in related fields could justify a more optimistic position, one still within the limits of uncertainty of the initial motion method. That the Geneva conferees recognized the potentialities of research is shown by their inclusion of long-period seismographs in the monitoring system when the specific contribution of these instruments could not be evaluated without further research. Preliminary results of work now in progress at Columbia University and the California Institute of Technology confirm this optimism and point to long-period seismograph recordings of surface waves as a significant new factor in the identification problem. Other preliminary studies now underway show the possibility of improvements in the first motion method which may be realizable with minor modifications in the Geneva system. Until these preliminary studies are implemented by active research programs which yield definite results, we cannot fully assess their importance. My own feeling is that the recent downgrading of the Geneva system identification capability will partially be offset by modifications in the Geneva system along lines indicated in current research. These modifications need not require an increase in the number of manned stations. Whether an identification capability for 5 kilotons or less can be achieved is speculative at this time. More underground tests will be required before this question can be answered. It is important, therefore, that in determining our position on a nuclear test ban, we should take full cognizance of the uncertainty and state of flux in this field.

It is indeed unfortunate that an active research program in this field was not prosecuted several years ago. Geophysicists were anxious to work on this problem, not only because of its strategic importance, but also for its usefulness in exploring the earth's interior. Support for this research was not easy to find.

DISARMAMENT AND FOREIGN POLICY

FRIDAY, JANUARY 30, 1959

U.S. SENATE,
SUBCOMMITTEE ON DISARMAMENT OF THE
COMMITTEE ON FOREIGN RELATIONS,
Washington, D.C.

The subcommittee met, pursuant to adjournment, at 10:15 a.m., in room F–82, U.S. Capitol Building, Senator Hubert H. Humphrey (chairman of the subcommittee) presiding.

Present: Senator Humphrey of the subcommittee and Senator Gore.

INTRODUCTION OF MR. FOSTER

Senator HUMPHREY. Our witness this morning is Mr. William C. Foster, a distinguished citizen who has served the nation in many capacities related to defense and foreign policy. His most recent assignment, from which he returned last month, was as chairman and senior U.S. expert at the "conference of experts for the study of possible measures which might be helpful in preventing surprise attack and for the preparation of a report thereon to governments." This conference was suspended indefinitely on December 18, although there have been indications recently that the conference may reconvene.

Mr. Foster has also served as Deputy Secretary of Defense, Administrator of the Economic Cooperation Administration and Under Secretary of Commerce. At the present time he is vice president for public affairs and a director of the Olin Mathieson Chemical Corp. He served in the Army in World War I and as Director of the Purchases Division of the Army Services Forces in World War II. Mr. Foster's experience makes him highly qualified and competent to discuss disarmament problems and their relation to defense and foreign policy.

Mr. Foster has been asked to give the subcommittee his evaluation of the Geneva Conference of Experts on measures to guard against surprise attack and his suggestions about future proposals in this field.

Mr. Foster.

Do you have a prepared statement, Mr. Foster?

STATEMENT OF WILLIAM C. FOSTER, CHAIRMAN AND SENIOR U.S. EXPERT AT THE CONFERENCE OF EXPERTS FOR THE STUDY OF POSSIBLE MEASURES WHICH MIGHT BE HELPFUL IN PREVENTING SURPRISE ATTACK

Mr. FOSTER. Yes, Mr. Chairman. In addition to my testimony, Mr. Chairman, I also have had supplied to you a copy of the United Nations document containing the report of the Conference which was agreed to at Geneva, and to which are appended a number of annexes,

all of which are very useful, I think, in establishing what we covered, and some of the ways in which questions were not covered in the Conference.

I do appreciate this opportunity of telling you about the Conference, and some of the technical aspects of the problem which we studied.

Senator HUMPHREY. Was this Conference under the general supervision or coordination of the U.N.?

Mr. FOSTER. You will recall, I believe it was before the Conference began, that the General Assembly passed a unanimous resolution stating that it looked with favor on the undertaking of this Conference, that they would gladly help to support it in stenographic and other administrative ways, and that they hoped that the Conference would make available to the United Nations the information which was developed in that Conference. The Conference facilities, the actual details of secretarial work, the distribution of documents, the interpretation and then the distribution first of this joint Conference report—and presently also the full verbatim account of the Conference were furnished by the United Nations. The report of the Conference and the verbatims have been released so that they are available to the public in the several languages.

UNITED NATIONS OBSERVER

Senator HUMPHREY. Was a U.N. observer there too?

Mr. FOSTER. Mr. Narayanan, who is the special representative of the Secretary General, Mr. Hammarskjold, attended all of the formal meetings with his assistant, and therefore they were there as observers.

Senator HUMPHREY. With no authority?

Mr. FOSTER. With no authority except that the first meeting was called to order under their auspices; that was the public meeting, Mr. Narayanan acted as chairman of that first meeting, after which it was turned over to the two sides by agreement, which agreement was worked out between Mr. Kuznetsov and myself, and we alternated the chairmanship between the two sides, and you also probably recall we alternated the chairmanship among the various groups of experts from the West, and they, in turn, followed that procedure on the East. So that after the first public meeting, the chairmanship always resided in one of the groups of experts.

Senator HUMPHREY. The experts at the Conference were drawn from the United States, the U.S.S.R., and other powers, were they not?

Mr. FOSTER. On the western side the other experts came from the United Kingdom, Canada, France, and Italy.

On the eastern side they came from Czechoslovakia, Poland, Albania, and Rumania. That is not necessarily the alphabetical order.

Mr. Chairman, if I may say, the full statement which you have and which I will leave with you goes into some details about the origins and proceedings of the meeting. And the Conference report itself, as I mentioned, is also available to you as well as the members of your committee, and I do commend this to you because certain of the documents are particularly important.

The final summation which I made on behalf of the West attempted to set forth the whole plan of our approach, and in the earlier annexes

we have developed the technical approach to this problem in several ways.

AIMS AND RESULTS OF THE CONFERENCE

We proposed first to identify the instruments of surprise attack, then the means of control (that is to say, the means of inspecting and observing them), the application of those means of control to the instruments of an attack, followed by an overall analysis. Some of these points I will make in more detail, if I may, in connection with my conclusions. This is, we think, not only a good record of what was accomplished in the formal meeting, but it also gives the flavor of our logical approach and points up rather sharply the Soviet emphasis on political measures in a conference which was called, from our point of view, to examine the technical military aspects.

I think it is a good piece, and it is to be valued for another reason. At various times during the last 2 or 3 weeks of the Conference, it was doubtful whether there would be any report at all because we couldn't agree on anything. We did, however, get agreement on this report as presented and on the conclusions therein. We did get agreement on the submission of this in this form to the United Nations and for its early release by the United Nations to the public. We also got agreement, you will note on page 3 of the report, on the point that the meetings had been helpful in clarifying for each side the views of the other side. We also were able to resist the conclusion that we immediately reconvene these meetings, which we felt would be completely inappropriate, in view of the fact that the terms of reference were so far apart. [Deleted.]

PRIVATE CONFERENCES WITH KUZNETSOV

Senator HUMPHREY. You had a number of personal conferences with Mr. Kuznetsov?

Mr. FOSTER. I presume I had 8 or 10 conferences in which just he and I conversed alone. I did not have my own brilliant staff with me, and he had none of his staff at these meetings, which were carried on in English which he speaks very well. I had a number of these, and I had perhaps 20 meetings at which he wished to have his interpreter and General Gryzlov present and at which I had interpreters and one or more of my political advisers, also. But probably we had more than 20 meetings which were not formal meetings and in which a good deal was accomplished. I think we may perhaps have accomplished more at these meetings than in the formal meetings, although I again say I believe the formal record is a good one from the viewpoint of the West. I think it points up a number of very useful things which can later be built on.

Senator HUMPHREY. Mr. Kuznetsov's title is Deputy Foreign Minister, is it not?

Mr. FOSTER. That is right.

Senator HUMPHREY. And he was the chairman of the Soviet delegation to this Surprise Attack Conference?

Mr. FOSTER. Yes, sir.

Senator HUMPHREY. He is the same Kuznetsov that was at the U.N. as one of the permanent delegates there, I believe.

Mr. FOSTER. Yes; that is right.

INCLUSION OF TEXT OF CONFERENCE REPORT

Senator HUMPHREY. This particular exhibit that Mr. Foster brings to us is entitled "Report of the Conference of Experts for the Study of Possible Measures Which Might Be Helpful in Preventing Surprise Attack and for the Preparation of a Report Thereon to Governments." We will include a reference to this report so that it may be readily found if anyone so wishes.[1]

Senator HUMPHREY. I understand copies of this report are available through the State Department or through the United Nations, is that correct, Mr. Foster?

Mr. FOSTER. That is correct. It is now contained in a United Nations document.

Senator HUMPHREY. Please proceed with your prepared statement, Mr. Foster.

BACKGROUND AND CONFERENCE PREPARATIONS

Mr. FOSTER. As a result of the exchange of correspondence between the Governments of the United States and the Soviet Union, arrangements were made for experts from the United States, the United Kingdom, Canada, France, and Italy to meet with experts from the U.S.S.R., Rumania, Poland, Czechoslovakia, and Albania in Geneva, Switzerland, beginning November 10, 1958, for a period of 4 to 5 weeks.

This conference and the conference of experts on the detection of nuclear tests which concluded on August 20, 1958, had their origin in the same correspondence. In his letter to Khrushchev of April 28, 1958, President Eisenhower reaffirmed our desire for joint technical study and suggested specifically that studies be undertaken concerning the detection of nuclear testing, also the problem of surprise attack. The Soviet Union responded to the former proposal shortly thereafter but did not agree to a technical discussion of the problems of surprise attack until a proposal of this kind was made in Mr. Khrushchev's letter of July 2, 1958.

In the correspondence which ensued a precise understanding as to the scope of the conference was not reached. The position of the U.S. Government was—

> that the primary purpose of the meeting should be to examine the methods and objects of control and to assess the results that might be obtained from the adoption of those methods in lessening the danger of surprise military attack * * * the discussions should take place without prejudice to the respective positions of the two governments as to the delimitation of areas within which measures might be established, or as to the timing or interdependence of various aspects of disarmament.

As in the case of the previous technical conference on the detection of nuclear tests, the U.S.S.R. throughout the preconference correspondence took the position that the purpose of the conference should be the discussion of certain predetermined measures.

> The work of the forthcoming conference of experts should be (a Soviet note of November 1 stated) directed to working out practical recommendations on measures for the prevention of surprise attack in conjunction with definite steps in the field of disarmament.

[1] The report referred to is: United Nations General Assembly, Report of the Conference of Experts for the Study of Possible Measures Which Might Be Helpful in Preventing Surprise Attack and for the Preparation of a Report Thereon to Governments, A/4078–S/4145, January 5, 1959.

The joint preparations of the western experts for the conference were made in the course of two series of meetings; the first being in Washington, D.C., from October 20 to 25 and the second in Geneva from November 6 to 9.

THE POSITION AND WORK OF THE WESTERN EXPERTS

The conception of the problem of surprise attack of the western experts is suggested by the following statement which was made at the conference:

> The progress of weapons technology has caused a steadily growing capability for damage by offensive weapons systems and in a steadily decreasing time required to inflict this damage. Consequently, the large military powers now maintain standing military forces capable of major strikes as the initial act of open hostilities. The destructive effects of such initial strikes is increasing to the point where they are ceasing to be the "opening of hostilities" and tend to become the decisive battle of the war, as well as the means for a near total destruction of the material civilization of a nation. The general awareness of this trend has tended to increase political tensions and to heighten the state of military readiness.

It was in the hope of at least beginning a discussion of this broad problem, with due attention to the new problems of security presented by long-range missiles and aircraft, that the United States assembled almost 50 of its best experts at Geneva. [Deleted.] Our aim was to approach the problem of surprise attack by considering arrangements for observation and inspection to forewarn against surprise attack. Beyond this, however, we suggested that under the third phase of our work plan we would have been prepared to consider and make allowances for changes which might take place, by unilateral action or mutual agreement, in the actual strength and condition of the weapons system under inspection. For long-range aircraft we suggested that the hypothetical changes in question might concern force levels, the pattern of aircraft operation, and aircraft types and other equipment.

FIVE-POINT PLAN OF WORK

The five-point plan of work which we proposed and which has been published as annex 3 to the report of the conference was aimed at avoiding political issues and insuring an orderly and logical progression from the relevant data to sound technical conclusions. Our plan was consistent with the increasing stress which the United States has given in both internal study and proposals for international discussion of disarmament and to the study of technical problems of inspection and control. The reason for this emphasis has, as you know, been to develop more negotiable proposals of more reliable and efficient arrangements and to derive a more detailed knowledge of alternative possibilities which would give our representatives greater flexibility in negotiation and a stronger posture in the face of propagandist proposals. We were hopeful of technical discussions at Geneva like those of last July and August on the detection of nuclear tests.

DOCUMENTS PRESENTED BY WESTERN EXPERTS

In the course of the conference we submitted a series of papers aimed at explaining and illustrating the kind of discussion we wished jointly to undertake with the experts on the other side and indicating the

area of evidence which would be relevant to such discussion. We tabled an analytical listing of the significant instruments of surprise attack together with relevant technical data on each. In addition we presented a survey of techniques for the observation and inspection of the instruments of surprise attack. The western experts also described illustrative systems of observation and inspection for certain instruments of surprise attack, and in addition presented a technical analysis of the value of warning systems and of factors to be considered in planning an integrated system. In view of the rejection by the other side of our plan of work and their refusal to put forward any meaningful technical data or propositions, we did not reach the point of developing these explanatory documents into finished technical submissions for the conference. We had to be content to block out in general terms the technical questions which we believed should be dealt with in a factual and scientific manner. Nevertheless, as I shall indicate later, we believe this was useful.

THE SOVIET POSITION

The Soviet representatives found in our approach three principal obstacles. In the first place, the Soviet experts and their colleagues, who were supported by exclusively political and military advisers, maintained that technical discussion of the kind conducted in July and August was not applicable to surprise attack. They insisted that the problem of surprise attack arose because of the military policies of specific governments such as the United States and that our concern to establish the relevance of certain data on weapons and detection devices was designed to evade what they called political realities. In this connection, they stressed above all the denuclearization of Germany, which was central to their November 28 proposals. It seems likely that they may have hoped to convert this particular technical conference into a forum for the political discussion of disarmament. [Deleted.]

Secondly, they insisted that discussion of the problem of surprise attack should, from the outset, clearly embrace what they called measures for arms limitation and reduction. They maintained that the sole purpose of the western experts was to create an observation system, which they pronounced worthless and which they maintained would only serve to gather military intelligence for the West and thus increase the danger of surprise attack. In this connection they claimed that our approach was inequitable and, in fact, as political as theirs. In addition they claimed that our approach overlooked the possibility of immediately practicable measures and aimed at the creation of an impossibly extensive system.

Thirdly, the Soviet representatives refused categorically to meet our desire to begin discussion of long-range missiles as well as aircraft. They would not clearly acknowledge the relevance of missiles to the problem of surprise attack. They stated that they would only discuss missiles when agreement had been reached on the elimination of nuclear weapons or on simultaneous discussions of this subject.

THE DECISION TO ADJOURN

All of these elements in the position of the other side led us to the conclusion that we could not have moved on to a useful discussion

without widening of the scope of the conference well beyond the area we were authorized and prepared to treat. [Deleted.] Accordingly, the wisest course seemed to be to suspend the meetings and from that vantage point seek to negotiate some more acceptable formula for future discussion of the problem of surprise attack.

In my conclusions I shall attempt to respond to questions which you, Mr. Chairman, have addressed to me both on the problem of devising a system to guard against surprise attack and on the conference itself. I do not think these two kinds of questions can be readily separated, since the form and desirability of various systems can ultimately only be worked out in international discussion, and evaluation of alternative possibilities must take account of tactical realities. Since our conference was concerned with the technical aspects of only one facet of the problem of disarmament, I shall only touch lightly on political issues.

SIMILARITY TO TECHNICAL CONFERENCE ON NUCLEAR TEST INSPECTION

Senator HUMPHREY. Am I to understand, then, that this conference on surprise attack was similar to the earlier conference on nuclear testing? This was not a political conference. It was essentially a conference of experts to prepare the way for further political discussions?

Mr. FOSTER. That is correct. The terms of reference for this conference provided that we, the western group, would send to this conference technical military experts who, in much the same fashion as last summer's discussions on the cessation of nuclear tests, would attempt to involve systems of detection and inspection which would help in reducing the danger of surprise attack. A political framework for such systems would be the subject of discussion in a later phase of the consideration of the problem by governments. We, however, as a group, were not authorized to do this and did not have the competence to do it. Our delegation was made up of scientists and military people. We had political advisers mainly to make sure that we were consistent in procedure. We were hopeful that we would progress, as had the summer conference, toward an agreement on technical measures. Our approach was that before building any machine one needed to have an agreement on the units of measure which would be applied to the design of parts.

We were hopeful that by an interchange between us they would agree on such units of measure that a machine might later be constructed. Without such agreement, we believed it would be very difficult to design a machine which both sides could feel would produce the kind of goods or end objects in which we were both interested. And therefore, we presented this point of view, believing it to be logical, and also presented the point that it would be very helpful to later negotiators, of whom Mr. Kuznetsov might be one, if there was such an understanding so that political pressures could be arrived at with some assurance.

PUBLIC RECORD TO AID FUTURE DISCUSSION

So that the first point which seems important, Mr. Chairman, is that we were able to get on public record a variety of documents

which will help to elicit realistic discussion of surprise attack in the future. The Soviet experts did accept obliquely on the record that the instruments listed in our submission on item 1 were those that could be used in a surprise attack. They also indirectly agreed that the techniques of observation and inspection listed in our submission on item 2 were those that would be available to governments. We also succeeded in bringing the Soviets to present for the first time an outline of the specific type of air and ground inspection they envisage, the shortcomings of which will be easily recognized by informed peoples. Incidentally, the outline of their system is presented in the conference report (annex 12). It is quite obvious that what they proposed was a system of self-inspection, inadequate at best, with very limited numbers of personnel assigned to the ground control posts, with very definite limitations on the way that they could move out, and with an unrealistic assignment of responsibilities.

Senator HUMPHREY. But at least you did get them to put in writing what the Soviet Union envisaged as an aerial and ground inspection program.

Mr. FOSTER. That is correct, and we believe this is useful because it does suggest the inadequacies to which we refer.

IMPORTANCE OF CONFIDENCE

Senator GORE. In the surprise attack conference, as well as in the nuclear weapons test conference, the prerequisite for an inspection system is unquestioned confidence, or mutual confidence, as it is sometimes put.

Mr. FOSTER. To have any value out of what they proposed, you would need unquestioned confidence.

Senator GORE. To fix any value upon it.

Mr. FOSTER. That is correct.

Now, we believe that it is possible to devise systems which would give confidence to each side in spite of mutual suspicion because of the thoroughness of the system and in certain cases by a use of modern sampling methods which would give you confidence because of the law of averages. In other words, there are a number of things you could do to offset what is, of course, today a lack of confidence. Such lack of confidence would not prevent your depending to a considerable extent on these systems if associated with proper limitation measures and a few other things which do not presently exist.

Senator GORE. Well, confidence comes neither from wishing for it, nor from proclaiming its desirability and necessity. Confidence comes step by step, and usually by demonstrated performance.

Mr. FOSTER. That is correct, sir.

Senator GORE. If step by step we can build confidence, that is wonderful, but it doesn't come overnight.

Mr. FOSTER. I would agree with that, sir.

The documents tabled by ourselves and the other side are all annexed to the report of the Conference which you have.

UNDERSTANDING OF PROBLEM WAS ADVANCED

Also important is the fact that our understanding of the problem—the understanding of the U.S. experts and other Western experts

associated with us—advanced considerably in the preparation of these papers. Our Government now has a conceptual foundation and a store of expert talent for dealing with this problem which it has really never had before

Senator HUMPHREY. I think this is a point that is very valid.

Mr. FOSTER. This I believe deeply.

Senator HUMPHREY. We have obtained special benefits as a result of these conferences—the Conference of Experts on Suspending Nuclear Weapons Tests, the Geneva Political Conference, and the Surprise Attack Conference. We have finally reached a point where we are talking about the mechanics of effective inspection systems, that might sometime develop into a feasible operative program. Moreover, we are obtaining a group of people who understand this subject.

Mr. FOSTER. I agree with this. This is only a start but it is the first good start toward these and a lot more must be done, but we now have a much more precise understanding of these problems.

We also have now a much more precise notion of the difficulty of separating the technical from the political in analyzing the problems of surprise attack and of the need, in pursuing technical discussions on the subject, to have agreement all around on what questions should be answered.

[Remarks deleted regarding the character of a future conference on preventing surprise attack.]

WORLDWIDE SYSTEM VERSUS SPECIFIC AREAS

You have asked, Mr. Chairman, whether I envision a system to guard against surprise attack on a worldwide basis or related to specific areas. To this I shall reply with a number of quite limited propositions. I have arrived at no conclusions on what would be an ideal system. In contrast to the Conference of Experts last July on the detection of nuclear tests, we did not conclude our Conference with agreement on the technical requirements of a given system which might be the subject of political negotiation. We are still at the point of considering hypothetical alternative systems rather than the political framework within which a given system might work. However, the requirements of a comprehensive system to reduce the danger of surprise attack affecting long-range weapons systems are so broad that we should continue to examine the possibility of more limited arrangements which might be safely implemented over a short period of time.

At the same time, however, I feel strongly that there are hazards in going into a discussion of the question of surprise attack without a better understanding with the U.S.S.R. on the central importance of long-range weapons systems to the problem and without additional study and discussion with our allies. We need, for example, detailed study of what zones of varying dimensions might mean for the balance of forces which exists in certain disputed areas. This study should take account not only of the weapons systems and forces situated within these areas but also those of global application. It should take account of both military and political implications.

UNANIMITY WITH EUROPEANS

Senator HUMPHREY. You are talking, for example, about the European security system?

Mr. FOSTER. [Deleted.] The Europeans are understandably much more sensitive on this subject than we are, as you know, and they went into this Conference along with us, and one of the great strengths of this Conference was the fact that on every question and every presentation, every document that we put forward, we had complete unanimity. We had, of course, many discussions at many points, but we also had complete unanimity and almost invariably this was accomplished right at Geneva in the Conference, itself. [Remarks on various subjects, including discussion of scope of future conferences, deleted.]

SOVIET SECRECY AS A MILITARY ASSET

One quite different point which I might mention, Mr. Chairman, is that we were much impressed by the importance which Soviet representatives attach to secrecy as a military asset. In effect, they seem to believe it enables them to possess a form of "hardening" of their bases which we do not have. Thus they regard any encroachment upon this secrecy as a unilateral disarmament step——

Senator GORE. What do you mean by "hardening" their bases?

Mr. FOSTER. Well, they seem to think we can't find them; that we don't know where they are, and that we have no idea of the location of their missile bases. If this was true, it could, of course, be just as effective as putting your missile underground, in a sense.

Senator HUMPHREY. Absolutely, or having a submarine.

[Deleted.]

Senator GORE. I didn't quite understand your term "hardening the bases."

Mr. FOSTER. Well, hardening in the sense of being resistant to a nuclear attack by another side.

Senator HUMPHREY. This is an important observation. Our bases are so open and theirs are so closed. When we ask for freedom of movement and inspection, they say, "Look, who is giving up what?"

Ours are not only known to everybody, they are quite vulnerable as they stand. Even though their missiles are just as vulnerable as ours to a nuclear attack, it isn't that vulnerable to the Soviet mind because they think we can't find them. Therefore, when they give up secrecy by letting us observe their bases and their tests, they think they may be giving up a great military asset which we don't now have. If they have an equivalent observation and inspection system in our country, to them that is not a fair trade. We have to find other measures, therefore, in addition to inspection and observation, to prevent surprise attack. This is the kind of thing that I am recommending that we study very deeply and thoroughly. I hope perhaps something is going to be done on that. Our people who have participated in this conference are the people who have the best knowledge of this problem. These talks at Geneva were mighty good exercises.

Mr. FOSTER. They are mighty good exercises, assuming we have the wisdom to do further work on them which I hope we are going to do.

Senator HUMPHREY. Until you faced these Soviet experts as you did, our discussion of these problems of preventing surprise attack and arriving at technical agreements was really very theoretical.

Mr. FOSTER. I think this is a fair judgment. I think this is the first time we have really had a hard war-gaming of these problems.

Senator HUMPHREY. We were discussing the very important subject of secrecy as a military asset of the Soviet Union.

SOVIET ATTITUDE ON OPENING UP MILITARY SECRETS

Mr. FOSTER. The Soviet representative appeared to regard any encroachment upon this advantage of secrecy which they believe they have as a unilateral disarmament step on their part, which must be compensated for by other measures. The technical argument which the Soviets used to give respectability to their opposition to measures limited to observation and inspection was that merely to disclose location of all the possible targets and the state of military activity to a would-be aggressor would improve the chances for a successful surprise attack. [Discussion on relation of inspection to other arms control measures deleted.]

EVOLUTION OF SOVIET POLICY

I might note that there was some movement in Soviet policy at the Conference. The Soviet proposal of November 28, which links a European inspection zone with political proposals for prohibition on nuclear and rocket weapons in Germany and a one-third reduction of foreign military forces within the inspection zone, represents a variation of a Soviet suggestion contained in their disarmament proposal of March 27, 1956, and to some extent in their proposal of April 30, 1957. In their latest proposal, however, the Soviets revised the proposal of April 30, 1957, in that the proposed Western area to be inspected would be expanded to include Greece, Iran, and Turkey, and the Eastern zone to include Japan and Okinawa.

Senator HUMPHREY. A rather broad expansion.

Mr. FOSTER. Yes.

They also limited the prohibition of nuclear weapons to Germany rather than to the entire European area of inspection, and proposed a one-third troop reduction in Europe in place of previous proposals for agreement upon specific force level figures for Europe. The Soviet proposal, moreover, is in some respects a shift in the Soviet position on the number—as distinct from the importance—of disarmament measures which must be included in any package containing areas of inspection. As you know, the U.S.S.R. has consistently taken the position that surprise attack measures should include measures of disarmament. In proposals in the London Disarmament Conference in 1957 the Soviets insisted that beginning measures of inspection be tied to force level and armament budget reductions, prohibition of the use of nuclear weapons, a nuclear test ban and agreement on specific foreign bases to be liquidated during the first 1- or 2-year period.

SUMMARY OF CONCLUSIONS

To sum up my conclusions, I repeat that I believe that the conference was potentially very valuable. To carry on further what was

accomplished, we need intensive study of our own policies as well as agreement with the U.S.S.R. and other countries on the terms of reference for another conference. Our resources for this purpose are now to my mind much improved over what they were last September.

[Discussion on character of future conference deleted.]

Senator HUMPHREY. According to your testimony today, and the observations of some of the analysts and commentators, one of the chief difficulties at the Geneva talks apparently was the difference in concept between the Soviet and Western sides as to what constituted measures to prevent surprise attack. You referred to that before.

Do you have any further suggestions as to how the approaches of each side might be modified so that further discussions might be fruitful? [Deleted.]

FUTURE COURSE OF U.S. ON SURPRISE ATTACK

What course should the United States now take in regard to prevention of surprise attack as a disarmament measure?

Mr. FOSTER. My comments must remain quite general for the reason that I doubt that we have up to this time really given the intense study to the kind of measures which will make this possible and which we would have to do before we go back into these further talks. I think we do have now an intimation of the kinds of things that might be helpful in this regard. I think that by hard work and deep thought and putting together competent people to work on this, not on a part-time basis but on a full-time basis, something very valuable could be accomplished. This is something we had not really done prior to the intensive preparations which we engaged in this fall. Out of the give and take across the conference table we began to see the directions in which future discussion might proceed, but we shall not know what the end of those roads will be until we spend a lot more thought and time on the problem. It has been my recommendation that we engage in this kind of study with competent people in which we wargame, and use the various assets such as the weapons systems evaluations group, the university research organizations, the scientists, the military people, to look at the problem not only from our national viewpoint but also try to put ourselves in the other fellow's point of view to see what he wants in this. We should use operations analyses and all the modern techniques of sampling and statistical review, and of course political guidance and wisdom as well to think through what we can and should propose to reduce the danger of surprise attack.

I think there is a hope that this could prove useful. I think this is a first step in a very long course. I think we should continue on this long course. We have generated a certain amount of momentum which I hope we will not lose, and it is for this reason that I believe these conferences were useful, and can be potentially more useful.

SOVIET ATTITUDE ON FUTURE DISCUSSIONS

Senator HUMPHREY. Do you feel that the Soviet Union has a desire to pursue further discussions on general disarmament?

Mr. FOSTER. At least they state that this is their position, and at least they have indicated their desire to continue talks in this general field, and I think this appears to be a desire which is general among

them. Whether it is purely for progaganda purposes, or whether it will really lead to fruitful agreements, only time will tell.

But, I believe we must in any case do the work to prepare us to know what we are offering and to know what the Soviets may be willing to accept. Out of this may come some real progress in this most important path.

LIMITED MEASURES FOR PREVENTING SURPRISE ATTACKS

Senator HUMPHREY. Do you think we should narrow our concepts of disarmament or of prevention of surprise attacks to very closely defined, limited areas or to particular instruments?

Mr. FOSTER. I think we should consider all kinds and types of areas. I think we must consider all kinds and types of instruments. This does not mean that we necessarily will come out with comprehensive complete controls, or necessarily come out with worldwide zones.

I think that out of an appropriate study we may find that the application of sampling procedures, the integration of a series of systems which have a partial look at a number of instruments, still may give to us a very useful amount of knowledge in connection with measures which will reduce the danger of surprise attack. These are the kinds of questions to which I can't give you a precise answer today, but I am sure these things are achievable, and I feel very strongly they must be worked out.

Senator HUMPHREY. I gather from your testimony that, while the conference did not produce the concrete results you would have liked, that you came away from the conference feeling it had been worth while, is that correct?

Mr. FOSTER. Very much worth while, contrary to the published reports. I think we achieved a great deal in many ways; a partial understanding on the part of the other side of what we have in mind as we approach the problem; a unanimity on the part of the Western experts as to the issues involved; and a great improvement of our knowledge of what we should be working at in order to make further progress.

Senator HUMPHREY. Do you really think the Soviet Union is fearful of a surprise attack by the United States and our allies?

RECENT DISPLAY OF SOVIET CONFIDENCE

Mr. FOSTER. I don't think so. And they are very much more confident about their own resources, actually, than I have ever observed in previous contacts with them.

Senator HUMPHREY. There is a remarkable display of new confidence on the part of the Soviet Union in the past year and a half or 2 years. Do you feel that this is based upon the reality of their strength, or is it based upon a deliberate decision for psychological warfare?

Mr. FOSTER. This, of course, is a personal impression, but my feeling is they have become fundamentally more confident of their own progress, of their own relative position of strength economically, militarily, and psychologically to our own. I think that is a change. I think for the first time they now clearly feel that, while they may acknowledge privately we are still the greatest power in the world,

they feel they have moved up very close to us and there is nobody anywhere in between, so to speak. I think this is something that has advantages and perhaps disadvantages. I think that they no longer lead from an inferiority complex. I feel they feel they can talk to us, so to speak, as equals, and they are confident with the increased rate of their own development that they will soon overtake us, perhaps pass us. I think this is a genuine feeling of confidence.

Senator HUMPHREY. Yes; I have noticed this, too. One is always weighing whether or not these attitudes of confidence, which are not always evident in verbal expressions, but just in general demeanor, are in accordance with a preconceived approach, or whether they are based upon solid accomplishments. My own feeling has been that they are beginning to feel now the momentum of their economic and military buildup, and seek to deal with us pretty much as equals.

Mr. FOSTER. I would agree with that. And of course, as you have just indicated, this has to be an intuitive rather than any precise evaluation of their approach. But I have this feeling from numerous contacts I had with these people over the 6 or 7 weeks that we were in contact with them.

SIGNIFICANCE OF UNILATERAL DEFENSE MEASURES

Senator HUMPHREY. You possibly recall a statement by Hanson Baldwin some time ago in the New York Times:

> Any inspection system that man can devise that is at once technically feasible and politically acceptable to both East and West is likely to be far less effective in safeguarding against surprise attack than the unilateral national defense measures of both the United States and Soviet Russia. Maintenance of the capability of massive nuclear retaliation is still the surest way of preventing a nuclear Pearl Harbor.

Do you think it is possible to devise a system for prevention of surprise attack that would give this country greater security than it now has? What in general do you think of that type of observation?

Mr. FOSTER. I think that one must always accept the thought that none of these measures will prevent surprise attack. I think what one must reach for is the ability to reduce the danger of surprise attack. Unilateral measures on the part of either side certainly are something that you must keep strong and active, and also be prepared to utilize. But bilateral agreements—whether for the limitation of armaments or merely observation and inspection—can add a proportionate value to the unilateral measure, and perhaps at a lesser cost than that of unilateral measures.

So that I don't agree entirely with what Hanson Baldwin said there. I think one has to look at it, however, from the viewpoint that unilateral measures—for example, measures to enhance the ability to retaliate—will undoubtedly have to be maintained, so as to make sure that an attacker will know that if he does mount a surprise attack he will pay a price for it.

I think what bilateral measures can add to the unilateral measures is an increase in the price that the attacker would have to pay. That price we would always hope would be sufficient to deter the attack.

Now, this is not only true of a rational enemy, but even has value in the case of an irrational enemy. Therefore as I say, while I do not disagree with the general philosophy of the statement, I would disagree with the implications to some extent. I believe his statement

should be made more precise and refined. I think it does, however, support the approach which I believe we must follow in preparing further analyses of these bilateral measures.

Senator HUMPHREY. In other words, it is not a question of "either or," but it is a combination of measures which gives us maximum security.

Mr. FOSTER. That is correct.

Senator HUMPHREY. The system for restraining surprise attack is complementary to our unilateral defense efforts.

Mr. FOSTER. That is correct.

SURPRISE ATTACK VERSUS LOCAL ATTACK

Senator HUMPHREY. You are very familiar with Dr. Henry Kissinger's general point of view. He spoke at the University of Minnesota last year, I think he placed in one paragraph pretty much his thinking in terms of the danger we have today of any type of war.

He says:

> I think that the danger of surprise attack is not nearly as great as the danger of local attack. And I think local attack can be more easily controlled than surprise attack through inspection. I am in favor of a ground inspection on both sides of the Iron Curtain in Europe. I think an open sky proposal cannot do any damage, but it will not do very much good. It isn't unsafe, it just isn't very meaningful anymore.

To what extent do you agree that the danger of massive surprise attack is not as great as the danger of local attack?

Mr. FOSTER. I would be inclined to agree with that. I think that we must have very strong forces to control and to meet the threat of and the actual development of limited wars. I think that in this present situation of massive striking forces on the other side, it may be that the inclination will be on the part of our enemy to continue probing attacks which need a limited response, and which, if met promptly and strongly, may discourage any further probing in that area.

I think this is the history of the last few years that have taken place. We have attempted each time to meet this sort of probe, and I think it is likely and more logical they will attempt to do this, since it does seem to me to be in the interest of our opponents, shall we say, to continue to press for weak spots rather than to face the terrible consequences of any massive nuclear attack.

Senator HUMPHREY. Yes.

Mr. FOSTER. And we should therefore, as a nation, maintain our ability to meet such limited probes and limited attacks and discourage the same, remaining prepared always to back it up, of course, with massive strength in case it goes further.

Unless we keep up that strength to meet limited attacks, it may be that you are forced to resort to the awful alternative of a nuclear strike, which would then have terrible consequences.

DISCUSSION OF LOCAL ATTACK AT GENEVA

Senator HUMPHREY. Did you discuss at Geneva a means of preventing local attack or of giving forewarning of local attack in any general system or in any particular geographic area?

Mr. FOSTER. No. If the U.S.S.R. had agreed not to inject into this technical military conference such political matters as proposals for the denuclearization of Germany, we should have been willing to discuss air and ground inspection within the context of an area including the United States, Canada, U.S.S.R., Western Europe, which would take into account the range of modern missiles. The Soviet representatives were not, however, prepared to meet us on this ground.

We, of course, discussed to some extent technically, the use of observation and inspection measures to observe the forces through which limited attack might be made. But this was not our main point. Our main concern was a massive surprise attack.

Senator HUMPHREY. Yes. However, in the light of the Soviet emphasis on ground troops, and of course in the light of our own insistence on the building up of NATO forces, this whole matter of inspection systems relating to the location and the movements of ground forces and conventional forces surely does come into play; does it not?

Mr. FOSTER. It does. I think that they still believe instinctively in spite of the logic against it, that you cannot mount any surprise attack without some kind of a concentration of ground forces. [Deleted.]

The point was made again and again and again. It is part of every proposition they have made. Their military said it, their political people said it, all of their people who touched on the point put this great emphasis on the fact that before you could mount any surprise attack there must be a concentration of ground forces, because only through ground forces do you really achieve complete surprise and complete victory. In some of these documents you will find our demonstration that this is not the case.

SURPRISE ATTACK BY GROUND FORCES

In one of the annexes in this U.N. report you will, of course, find our concept of how an observation and inspection system might be applied to movements and concentrations of ground forces, to reduce the danger of surprise attack.

We think this is a very good technical paper, and outlines our own approach to this problem.

As you will recall, sir, in the slight exchange I had with Mr. Mikoyan at which you were present, I said, "Is this not a rather foolish limitation of geography in view of the range of modern weapons?" And he again said this is the only way to get at it.

Senator HUMPHREY. They are quite fanatical about this subject.

Mr. FOSTER. They are fanatical about it, but you can't be sure this is their honest, their genuine belief.

[Deleted.]

Senator HUMPHREY. Have you been able to impress the higher political officers of our Government with this point of view, Mr. Foster?

[Deleted.]

Mr. FOSTER. I was also struck by the apparent intensity of Soviet feeling on the remilitarization of Germany, particularly the possibility that Germany will gain nuclear capability. [Deleted.]

Senator HUMPHREY. Mr. Foster, do you really believe that the Soviets are deeply concerned about this problem, or is this a part of their general propaganda?

In other words, is there substance to this feeling, or is this something that is used conveniently to maintain tension and uncertainty in central Europe?

Mr. FOSTER. [Deleted.]

DISTINGUISHING MANEUVERS FROM ATTACK

Senator HUMPHREY. Mr. Kissinger in his book emphasizes that there is always movement of military power on the part of the Soviet Union, ourselves, and others. There are planes in flight, there are troops on some sort of a maneuver. Therefore, he says:

> Unless most planes are grounded all the time and both sides are certain that no substantial air installations are hidden, there is no guarantee that planes on so-called training missions will not be used for a surprise attack.

There are apparently Soviet submarines, for example, moving constantly in international waters. Let us say they were equipped with types of missiles and rockets. There are daily flights of the U.S. Strategic Air Command allegedly carrying atomic weapons.

How can inspection differentiate between a routine maneuver and planned aggression?

Mr. FOSTER. Well, we believe there are ways. This was the subject of a good deal of study on the part of our technical military people. In the systems which we have described, we suggested some ways of differentiating, by identification, for instance, of the storage zones of nuclear warheads, and by the movement of fuel onto a base, which if it were to be a surprise attack would be of much more massive nature than that associated with training flights. Electronic emissions are another indicator. There are a number of ways in which you can identify the difference between such training activities and a true massive strike. Any one of these things in individual cases could not be taken as an aid in distinguishing a training flight from a massive attack, but when a number of these occur together, you may get a quite precise and clear indication that this is much greater than the training flight activities. Therefore you at least have a chance to put yourself in a position to avoid destruction before you have a chance to have your retaliatory forces in motion.

The correlation of these indicators has to be done in evaluation centers. These are not only useful to reduce the danger of deliberate surprise attack. They also have value in preventing an accidental or miscalculated attack, because you can, through these evaluation processes and through feedback procedures, find that a given action may be an isolated instance instead of the major attack which your first report from an observation team may have indicated.

Senator HUMPHREY. Your feeling is then that if there was to be a real surprise attack, it would come in rather large units, for example, large numbers of planes or missiles, or submarines offshore. For that kind of operation there would have to be a substantial movement of material, personnel, and all the other technical equipment that would be required, is that it?

Mr. FOSTER. At least substantial changes from the normal procedures associated with training activities. You could, of course, with

certain kinds of missiles and certain sizes of warheads mount a surprise attack which could be very devastating with a rather modest number of weapons of attack. But even that could be distinguished, we believe, by these systems, from normal training activities.

NEED FOR AIR INSPECTION BEFORE ICBM'S BECOME OPERATIONAL

Senator HUMPHREY. When we were in Boston about 2 years ago, Mr. Walter J. Levison, assistant director of the Boston University Physics Research Laboratory, testified:

> I am forced to conclude that if air reconnaissance is to prove effective as a tool for inspection, the inspection system must be in operation before intercontinental ballistic missiles are included in the Soviet inventory of weapons system.

His earlier testimony and that of others had been to the effect that you could disguise missile-launching platforms, by placing them underground. Therefore if an inspection system had not been inaugurated before the intercontinental ballistic missile became operational, you would never be able to really detect where they were.

Mr. FOSTER. Certainly the longer there is to develop the efficiency and the numbers of such missile sites before an observation and inspection system is applied, the less value will come out of observation measures alone, and therefore it is a matter of urgency, I think, as he has stated, that the sooner one could approach some such agreement the better it would be for the world and for both sides in developing means of warning against surprise attack.

Nonetheless, again referring to the Conference report, we have described in one of its annexes (annex 13) a system of observation and inspection which could be applied against the launching of missiles which would have value of itself. The size of our expenditures on early warning alone suggests that it would. But the earlier it is applied the better it would be.

PROBLEMS IN PREVENTING SURPRISE MISSILE ATTACK

The degree of assurance would, however, be limited according to the difficulties of installation, and would vary according to the date of installation. The earlier it is applied the better. The development of missile-bearing submarines is a case in point. The impracticability of observers on submarines or of some scheme to require nuclear-powered submarines on maneuvers to reveal their location at suitable intervals is self-evident. Such questions as these deserve intensive study. Ground control posts and aerial photography, as such, would have some value in reducing the nature of surprise attack. If it were used in conjunction with limitation of the number of airplanes in the air at one time, how much more effective would that be? How much more time would it give as warning; and therefore, how much more would the apparent cost to an attacker seem to be if it were associated with these other measures?

Senator HUMPHREY. It seems to me terribly important that there be a concentrated effort by technicians and the people who are involved in the problem of preventing surprise attack to perfect means of inspection and detection in this missile field.

For example: We discovered that you can hide nuclear warheads or atomic bombs. Once they are properly hidden there is no way

known today of being able to discover them. Once these missiles become operational and disguised platforms can be erected, we are in real difficulty in regards to inspection.

Mr. FOSTER. It certainly becomes a good deal more difficult and therefore we must move, if we are to make progress in this, with urgency to try to attempt to find measures whereby we can reduce these dangers.

One of the reasons we put so much emphasis on applying observation and inspection to the vehicles which carry the nuclear warheads is that the missiles, the carriers themselves, are much easier to observe and detect than are the nuclear warheads, as you just indicated a moment ago.

SOVIET POSITION ON BANNING BOMB

Senator HUMPHREY. Right.

Mr. FOSTER. The Soviet representatives maintained "in order really to prevent surprise attack, you must ban the nuclear bomb." We replied "How will you know it is banned, since it is impossible to verify such a commitment? So far as we know you have never been able to discover a practical way of detecting concealed nuclear weapons and you have so stated in some of your pronouncements, in disarmament discussion. We certainly agree with this and have so stated. If you have found a way to remedy this deficiency, we would be very happy to hear of it. It might change the approach to this problem." To this they had no response.

Senator HUMPHREY. When it comes to missiles and airplanes, we can have a radar screen that is reasonably effective in giving some advance warning. I suppose there will be ways and means discovered even to give advance warning of a flight of missiles.

SUBMARINE MISSILE ATTACK

But what about submarines? A recent report of the Underseas Warfare Advisory Panel to the Subcommittee on Military Applications of the Joint Committee on Atomic Energy stated: [1]

> An attack by a single Polaris-type submarine, which might carry 16 or more missiles with hydrogen warheads, could decimate several of our cities. A massive attack with such weapons could level our entire urban society.
>
> The day is rapidly nearing when the Soviet Union can possess, first a few, and then a large fleet of intermediate range ballistic missile-launching nuclear-propelled submarines.
>
> Our existing and presently planned defensive system could not stop such a missile attack.

According to the Panel:

> Under certain conditions present listening equipment is capable of obtaining a moderately accurate bearing on a fast moving or snorkeling submarine at about 100 miles.

As the quotation indicates, our detection system for the location of submarines reaches out only about 100 miles. If you get a Polaris-type submarine operating in the Soviet Navy—and assuming that some Soviet subs are being equipped for rocket launching—what do we do about detection on that?

---

[1] U.S. Congress, Joint Committee on Atomic Energy, report of the Underseas Warfare Advisory Panel to the Subcommittee on Military Applications of the Joint Committee on Atomic Energy, Washington, Government Printing Office, 1958 (Joint Committee print).

Mr. FOSTER. Well, it becomes a much more difficult job, which of course is the reason for our own emphasis on the building of that type of submarines. They are mobile; they are difficult, if not impossible, to detect, and it is possible as we know—it has been publicly stated—to fire a missile while still submerged without ever coming to the surface. The only methods we have developed so far to identify the location of submarines is not as effective as we would like to have it.

So that your statement is quite correct. It is a real problem. We must consider other measures, at least in some degree, if we are to have assurance of some protection against the imminence of surprise attack by that means.

DETECTION OF SUBMARINES

Senator HUMPHREY. Do you know of any means that we now have, or any equipment, to detect submarines before they get within 100 miles of our shores, when traveling underwater?

Mr. FOSTER. Mr. Chairman, I have not kept directly in touch with the improvements in that sphere, but I am informed that we are making advances of considerable moment. I do not know what they are. I do not know the degree of improvement.

Senator HUMPHREY. But you have recommended more research in the study of this area, is that correct?

Mr. FOSTER. It is not my concern, in my present position, to make recommendations of this kind. I am always interested in this part of our defenses, and certainly this would be one of the elements we would have to study if we were to continue our studies as to means to reduce the dangers of surprise attack.

RELATIONSHIP OF MILITARY BASES TO DISARMAMENT

Senator HUMPHREY. Could you tell us what is the relationship of the question of our overseas bases, control of outer space, and prevention of surprise attack? We understand that you had some discussions on this with Mr. Kuznetsov.

Mr. FOSTER. May I have that one back again? That was kind of a big question.

Senator HUMPHREY. In its draft resolution on the peaceful use of outer space, the Soviet Union included as one of the principles on which an agreement should be based—

> The elimination of foreign military bases on the territories of other states, primarily in Europe, the Near and Middle East, and North Africa.

In addition, the Soviet Union claimed that—

> Really reliable measures to remove the danger of a surprise attack can be worked out only if there is complete prohibition of atomic and hydrogen weapons * * * if military bases on foreign territory are removed and there is a substantial reduction of armed forces and armaments.

That is the Soviet position.

Could you tell us what is the relationship of the question of our overseas bases, control of outer space, and prevention of surprise attack?

Did you discuss this matter with the Soviet representatives and did they discuss it with you in a serious and logical manner, or is this just general propaganda that the Soviet Union uses?

Mr. FOSTER. I would classify this as general Soviet propaganda, because this approach, in the formal meetings, was the first statement they made almost every day, it was the first set of statements they made in their public presentation at the initiation of the Conference, and it was repeated again and again in the presentation of what were alleged to be technical papers, namely, before you could in any way move forward what they called practical measures, you must ban the bomb, you must get rid of the overseas bases, you must reduce the troops in other countries.

They added other supplements to this. They introduced a suggested measure which would confine the flights of bombers loaded with nuclear bombs to the Continent, or to the country to which the bomber belonged. And these points which they invariably made were, in my opinion, a propaganda pronouncement, because they did not really show any indication of a desire to discuss them from a technical viewpoint. [Deleted.]

ADMINISTRATIVE STUDY ON BASES

Senator HUMPHREY. Secretary Dulles stated on May 29, 1957, there had been an overall administrative study which had been going on for a good many months to deal with this whole problem of so-called overseas bases and forces abroad. You may recall that. I expect some report will be made on the basis of that study within the next few months, and probably decisions will be taken on the basis of it.

Are you familiar with any conclusions of this study?

Mr. FOSTER. Can you talk about that, Mr. Sullivan? That was the Nash study, and Mr. Sullivan was part of it.

Mr. SULLIVAN. A number of recommendations were made as a result of the base survey. These are still under study, on a country-by-country basis. [Deleted.]

All of these do take time, and they are still under very active study.

Mr. FOSTER. My only point, Mr. Chairman, is that in this particular exercise, this study did not come to my attention.

Senator HUMPHREY. My asking of this question regarding the study on bases is to be interpreted as forewarning. We are going to ask some more questions about this study at a later time.

It is almost 2 years since that study was announced. The Departments ought to be aware of the fact that as the military appropriations come down, and as the Mutual Security Act comes before the Foreign Relations Committee, I am going to ask some questions about the report on bases. Others are going to ask some questions about it. As the Secretary himself indicated, there are some serious problems about the relationship between these overseas bases, the forces stationed in them, and the costs involved therein, on the one hand, and the amount that these bases and forces contribute to our overall foreign policy objectives and national security, on the other.

I am not, per se, against bases. Don't misunderstand me. I think it is a matter of careful evaluation as to what you get out of them in terms of security vis-a-vis cost. It is a matter of whether or not the forces stationed at them could be used more effectively some place else.

I think we have to look into this. [Deleted.]

We make commitments in all good intent. We are a big power, and nations come to us and say, "Look, we are being pressed, we would like a mutual security pact with you." We then make commitments for military missions and military assistance. Thus we keep spreading out our military strength and do not build it up in depth.

I think there is a region of danger in which you can get more commitments than you are capable of fulfilling within present military capabilities. I think we can fulfill all the commitments we have made, and then some, if we are willing to pay the price. But the question then comes up as to whether or not we are willing to pay the price.

This is a matter that I intend to inquire into. I don't believe that this matter of bases should be brought up later by surprise, so I thought I would give the executive branch a little advance notice.

INTERNATIONALIZATION OF BASES

You are familiar with Philip Noel Baker. He discussed these problems of overseas bases in connection with disarmament. He stated if proper arrangements were made in the disarmament treaty for collective security, some Army and Navy bases might be internationalized under the authority of the U.N. for use in case of collective action against aggression. Some might be handed over to a standing U.N. international force, if that is created by the treaty. He suggested that bases at Cyprus, Gaza, Suez, Okinawa, and Trincomalee might be most suitable. His idea was that if these bases were maintained as U.N. bases for international contingents, that it would be a constructive and forward step.

What is your comment on that?

Mr. FOSTER. Mr. Chairman, I will respond to that as I did to Mr. Kuznetsov a few times. I am here as a technical military expert, and I would consider that largely a question of political consideration.

Senator HUMPHREY. Thank you very much.

NATIONAL DEFENSE AND BARGAINING POWER

Do you have any suggestions as to the areas of the Defense Establishment that should be strengthened in order to give us better political bargaining power?

Maybe I should ask before that: Do you feel that our bargaining power at these conferences is related rather directly to our military power and that of our allies?

Mr. FOSTER. I feel it is very definitely related to it, and that the only way in which we can really bargain with some confidence is to have the strength backing us up so that we can bargain.

I would be very hesitant of any reduction, very skeptical that we would be able to bargain effectively unless we maintained sufficient strength.

Senator HUMPHREY. Do you have any feeling that there is a need for bolstering our strength, or reinforcing our national security base?

Mr. FOSTER. Well, I am perhaps a prejudiced witness in that regard. I would like to see, in certain areas, greater developments in our military activity.

Senator HUMPHREY. Like what?

Mr. FOSTER. I would like to see more emphasis on these Polaris submarines; I would like to see a more active pursuit of certain classes of missiles; I would like to see a greater emphasis on long-range research and development, and perhaps a greater utilization of the research facilities that the United States has toward this end.

These comments, however, are not based on a current, or a close connection with these things. Therefore these comments are not necessarily as valid as they might have been a few years ago, because much of what I read now, much of what I know now I read in the papers.

Senator HUMPHREY. You are a very informed and qualified witness, Mr. Foster.

When you say certain classes of missiles or types of missiles should be expanded and developed, what do you mean? Do you have a particular category like intermediate range or intercontinental range missiles in mind?

"HARDENING" MISSILE BASES

Mr. FOSTER. Well, I would like to see us take certain additional unilateral measures, such as hardening of our missile bases; I would like to see greater emphasis therefore on solid propellant missiles, the bases for which are much easier to harden than those for the liquid-propelled variety.

Senator HUMPHREY. What do you mean by "hardening"?

Mr. FOSTER. That is, hardening in the sense I have used it; to increase the ability to resist.

Senator HUMPHREY. To resist detection?

Mr. FOSTER. No. To resist greater pressures which might come from a nuclear detonation which would be capable of destroying the ability to launch the liquid-propelled missile.

On the other hand, the solid-propellant missile has three attributes. One, it is somewhat smaller and lighter. Two, it is easier to store away. Three, it is more readily fired on short notice because the preparation is shorter. It can be put underground. It can be associated with less support facilities, and it can be dispersed more readily. All of these things contribute to the general process of hardening in the sense that the ability to respond even after attack is increased.

Senator HUMPHREY. Let's assume that that type of program were instituted, and realized. Do you feel this would assist you if you were again placed in a responsible position at an international conference relating to some degree of weapons control, or to prevention of surprise attack? Do you feel that, once you have hardened our military position, you have greater strength in your negotiating posture?

Mr. FOSTER. I certainly do; and of course in addition to that, the development of certain unilateral measures of this sort could conceivably, even with somewhat limited forms of observation and inspection, make it impossible for an opponent to win a war, to effect the destruction which they could without these measures.

Therefore, from the viewpoint of bargaining, as well as of resisting an attack, these are, in my opinion, the desirable things to do. But again I emphasize that these are personal observations. I am not concerned directly with these particular plans, and I don't know all the things that perhaps I should know at this point in time in order to respond in a completely informed way to the sense of your question.

Senator HUMPHREY. Do you know whether the Soviet Union has solid-fuel missiles?

Mr. FOSTER. I don't know completely. I certainly suspect that they do.

Senator HUMPHREY. What one do we have that is——

Mr. FOSTER. The Minuteman will be. The Polaris is a solid propellant.

Senator HUMPHREY. That is right.

I am very grateful to you. I want you to know that a copy of this transcript will be made available to every Senator.

Every member of the committee was hopeful that you could come when you said you would, and we are most appreciative. We will, as necessary, call upon you again for advice and counsel in this area. Any further information that you or any of your people may feel that you can supply us that will be helpful we would appreciate.

Mr. FOSTER. Thank you very much, Mr. Chairman. I appreciate the opportunity of appearing before you.

Senator HUMPHREY. Thank you, Mr. Foster.

(Whereupon, at 1:20 p.m., a recess was taken until 2:30 p.m., this same day.)

AFTERNOON SESSION

Present: Senators Humphrey (chairman) and Long.

Senator HUMPHREY. The meeting will come to order.

This afternoon we have invited Adm. Arleigh Burke, Chief of Naval Operations, to testify on the relation of defense matters to disarmament, and Monday morning we have scheduled Gen. Maxwell Taylor, Chief of Staff of the Army, and Gen. Thomas White, Air Force Chief of Staff, to appear on the same subject. The appearance of the three service chiefs has been arranged to accommodate their crowded schedules.

From the testimony of all three Chiefs of Staff we hope to obtain a balanced presentation of the views of the National Military Establishment regarding the relation of arms control measures to national defense strategy and capabilities. Topics which we plan to explore include the effects of nuclear arms control upon weapons development and upon cooperative defense with our allies, arms control in Europe, the relation of nuclear weapons to limited conflicts, the problem of preventing surprise attack, the participation of the Defense Department in preparation of disarmament proposals, and others. Although our hearing is held in executive session, the transcript will be released as soon as classified information has been deleted.

In the letter inviting you to testify, I believe that questions were given to you which indicated the general outline of the subject matter to which we would like to have you direct your attention.

This morning we had Mr. William C. Foster who, as you know, was the chairman of our delegation to the Geneva Conference on surprise attack.

Mr. Foster ended his testimony with a statement to the effect that at any conference with the Soviet Union, particularly concerning arms control or prevention of surprise attack, our negotiating position is directly related to the degree of our strength.

In other words, paradoxical as it may seem, according to Mr. Foster we have a better chance of getting disarmament agreements from the

Soviet Union when we are armed. We have less prospect of negotiating a suitable and effective arrangement if we enter the negotiations in a weakened military posture.

A strong posture on the part of our country gives us strong bargaining power. A weak posture leaves us with little hope for success.

Mr. Foster concluded that the Soviet representatives have exhibited more confidence lately than they have for some time.

I asked him whether or not that was a confidence premeditated for purposes of psychological warfare, or whether it was a confidence based on real power strength and the beginning of real economic forward movements. Mr. Foster thought the Soviet confidence was of the latter type, built upon a realization that the Soviet Union was strong, and growing stronger.

You will be interested to know that he also commented at length upon the Polaris underwater defense instruments, and the desirability of certain long-range research and development in particular kinds of weapons, for example, solid fuel missiles.

I thought I would review that for you in the interest of continuity.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. Have you a prepared statement?

Admiral BURKE. Yes, sir.

Senator HUMPHREY. You may give us the conclusions of your statement or you may read it all to us.

STATEMENT OF ADM. ARLEIGH A. BURKE, CHIEF OF NAVAL OPERATIONS, U.S. NAVY

Admiral BURKE. I can read it, sir, and it is not very long, sir.

Mr. Chairman, I welcome this opportunity to appear before this committee for a frank exchange of views on the relationship of arms control problems to overall foreign and defense policies.

Although the Department of State is primarily responsible for the formulation of U.S. disarmament policy and the conduct of international disarmament negotiations, the Navy has a great interest in these matters and participates in many ways.

This interest stems in part from the experience of the 1920's and 1930's when the Navy was the only U.S. military service whose forces were limited by international agreement.

It is also based on our concern for the security of the free world in the face of the threat from the Soviet Union whose leaders are meeting this very day to reaffirm their goal of world conquest through the threat of military force, economic penetration and political subversion.

Senator HUMPHREY. I think it is very desirable that that line be underscored.

You do not mind my interrupting you?

Admiral BURKE. No.

Senator HUMPHREY. The headlines would have us believe that the Soviets are concentrating on economic penetration. However, the full statements of Mr. Khrushchev will reveal that this man is a master of intermeshing various forces. Economic penetration is made all the more powerful by the fact of military force.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. And subversion.

Admiral BURKE. And subversion backing it up.

Earlier this week I had an opportunity to discuss in the Armed Services Committee our estimate of this threat and the military posture that the Navy believes is required to counter that threat.

Briefly, we believe that the United States must have a diversified, retaliatory force with minimum vulnerability to enemy missile and aircraft attack, to deter the Soviet leaders from starting a general suicidal nuclear war. Force requirements for this are finite and measurable.

The United States must also have mobile, self-contained forces, ready to respond to widely separated Soviet probings at the periphery of the free world. We have learned this lesson on many occasions since World War II, most recently at Lebanon and Quemoy.

The determination of the proper military posture of the United States to deter general nuclear war, limit other hostilities or prosecute the cold war is a matter for unilateral decision by the U.S. Government. But just the same, it is necessary for the United States to explore the possibilities of finding acceptable common ground for agreement with the Soviets on arms control measures.

In the face of the record of circumvention of international agreements by the Soviets, we believe that any disarmament agreement with them must include an inspection system which will reveal immediately any violation of the agreement. In addition self-enforcing guarantees must be included.

Let me now turn to a brief summary of the general categories that you desire to discuss.

EFFECTS OF TEST SUSPENSION

The effects of nuclear arms control involve considerations under two major conditions; the first is test suspension; the second, which has more serious implications, is production cutoff.

Under a nuclear test ban our current strategy and requirements would undergo no major changes. While no specific requests already submitted to the Atomic Energy Commission for development of warheads will be completely unfulfilled, a test ban would freeze certain important planned developments. For example, we would like to have a Polaris warhead with twice or more the present yield, which we can expect if tests proceed. Furthermore, a test ban would inhibit our ability to meet future applications of Soviet military power which cannot be completely predicted at this time.

Also, a test ban would influence the important area of antisubmarine warfare. From previous tests we have data on lethal ranges against submarines and safe delivery ranges for aircraft. We do not have adequate data to determine with accuracy the safe minimum delivery ranges for ships in order to make most effective use of these weapons. We do not know whether a freeze in testing can be overcome by developments in other areas, but it is unlikely.

EFFECT OF CUTOFF OF PRODUCTION

In the more serious situation of production cutoff, the following effects are likely. Some nuclear material with a short life would degrade as material decayed. Weapons which require materials such as tritium, with a short half life, would have to be replaced by weapons

which use older nuclear techniques. This would give us less efficient weapons with reduced tactical flexibility in their use.

POLICY ON USE OF NUCLEAR WEAPONS

Our present limited war policy is to maintain adequate versatile forces suitable for limited war, to use tactical nuclear weapons if necessary and to prevent expansion to general war. This policy requires us to have both conventional and nuclear weapons. The Navy tries to achieve a proper balance.

Most of our allies, particularly the NATO countries, recognize that in a general nuclear war, nuclear weapons may well be required in defense of their homeland.

Outside the NATO area, the attitude of countries varies from the acceptance of the need, as in the case of South Korea and the Republic of China, to the rejection of our nuclear philosophy as in the case of Japan.

On the other hand, no country desires to become a nuclear battlefield and in limited war we can expect that there may be considerable political opposition to the use of nuclear weapons.

Recently there has been great interest in the problem of preventing strategic surprise attack.

Along with the other services, the Navy has begun a restudy of this problem in the light of the recent talks in Geneva.

Senator HUMPHREY. May I interrupt you, Admiral?

Admiral BURKE. Yes, sir.

CONFERENCE ON PREVENTION OF SURPRISE ATTACK

Senator HUMPHREY. Have you or members of your immediate staff visited at length with Mr. William Foster?

Admiral BURKE. Yes, sir. Mr. Foster came down to the Joint Chiefs of Staff and discussed the subject with them. We had our own officers who were with him and his group, and they came back and briefed all the groups of our people.

Senator HUMPHREY. Very good.

Do you agree with Mr. Foster that one of the achievements of this conference was the organization of a team of experts to study, at least, all of the many technical aspects of an inspection and control system designed for the prevention of surprise attack?

Admiral BURKE. Yes, sir; I do.

Another thing which I think is even more important, and that has caused a good many people to understand the difficulties of negotiating with the Soviets, is as Mr. Foster said, you have to negotiate from a position of strength, you cannot believe them, you have to have automatic devices in any agreement in the event they failed to live up to the agreement.

VALUE OF INSPECTION SYSTEM

Senator HUMPHREY. One of your distinguished predecessors, Admiral Radford, once said that an inspection and control system is a substitute for trust. In other words, if you cannot trust, you have to develop a system that is an alternate or a substitute for trust.

Admiral BURKE. Yes, sir. It is a first step in generating confidence, and another matter is to make sure that you know what he is doing. If he does things all right, then you can just gradually build up confidence, but until you can build that confidence, then you must build an inspection procedure that you know will be effective.

Senator HUMPHREY. One of the main purposes of this subcommittee, in its 3 years of life, has been to encourage the responsible officers of our Government to concentrate their attention on the development of an effective inspection and control system.

Talk about disarmament and arms control without an effective control system can be very misleading.

Admiral BURKE. Yes.

Senator HUMPHREY. We need to concentrate our attention upon this whole subject matter of developing an alternative or a substitute for what would be trust in normal human relations. We have to develop a mechanical system, so to speak.

PREVENTION OF SURPRISE ATTACK

Admiral BURKE. Yes, sir; I certainly agree.

There are certain fundamental aspects of this problem. Surprise attack is not limited to attacks only by ICBM's or long-range bombers, but can involve attack through rapid movement of sea or land forces as well. This is of particular concern to our allies.

No known control measures can guarantee the prevention of surprise attack by a determined aggressor.

The best that can be expected is that certain control measures may discourage an aggressor from launching surprise attack by depriving him of the assurance of complete surprise.

We must be wary of proposals which would reduce or restrict our ability to deter general nuclear war through the maintenance of a diversified retaliatory force.

Also we must be wary of proposals which would reduce or restrict our ability to respond quickly with adequate military force to Soviet probes at the free world wherever they occur.

NAVY ROLE IN DISARMAMENT POLICY

The Navy participates in the formulation of disarmament policy through two formal channels—through the Secretary who comments directly to the Secretary of Defense on matters of overall national interest; and through the Joint Chiefs of Staff who comment on matters of primary military importance, and in many informal conferences with other interested agencies.

The Navy works through the same channels in commenting on the position papers for disarmament negotiations and on issues that arise during the negotiations.

Naval officers have been assigned to nearly all U.S. delegations to disarmament talks and to interagency groups studying disarmament problems, such as the Stassen "task forces."

This entire area has been and will continue to be of foremost interest to the Navy.

One of our most challenging problems as a Nation today is our negotiations with the Soviet Union on disarmament. We must under-

stand motive; know hidden meaning behind their every move. To accomplish this we must know them, learn their ways, recognize their goals. We must be positive that any agreement does not upset our relative power position. This will require hard work by all of us for a long time.

PRODUCTION CUTOFF

Senator HUMPHREY. I would like to thank you very much, Admiral, and then pick up one or two thoughts that you have developed here.

You have made a concise and, I think, very meaningful statement relating to production cutoff. This is not a subject that is currently a matter of any negotiation.

Admiral BURKE. No, sir.

Senator HUMPHREY. Even though it has been stressed a great deal by our country, Admiral.

Admiral BURKE. Yes.

Senator HUMPHREY. As a matter of fact, our official Government position has appeared to place more emphasis on a production cutoff than it has on the banning of tests.

The Soviets have said, "Ban the bomb and stop the tests."

We have said, "Stop the production."

You have made a very pertinent observation here, which has not been given adequate attention, about the short half-life of some of the more usable material, from the point of view of effectiveness in new as opposed to more conventional or older types of nuclear weapons.

Admiral BURKE. Yes, sir.

NEGOTIATING

Senator HUMPHREY. I have often been concerned about the number of disarmament proposals that we present at a single time, and I wonder what would happen if all of them were accepted.

I think, sometimes, that we do not think these things through as much as we should. I am not complaining about your statement. I am just thinking out loud about the number of proposals that we advanced, let us say, a couple of years ago in London. At that time we were talking about cessation of tests, cutoff of production of nuclear materials for weapons purposes, reduction of forces and other proposals as well; yet we did not have an adequate inspection system designed for any of these measures.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. I feel personally that it is very dangerous to pursue a course of action unless you have thought it through to its logical consequence.

Admiral BURKE. Yes, sir.

There is a tendency on the part of Americans to want to reach an agreement, and they will give in order to reach an agreement, even when the agreement may be adverse to them, and it frequently is.

The way the Russians negotiate is that they start from what they would like to have, and then they fall back to their present position, I mean, to the present status quo.

We start from the present status quo, and then frequently in many areas, fall back to a position which we would or could accept, and it is hard to win that way.

That has happened to some extent in the Korean negotiations in which I participated.

Senator HUMPHREY. I know.

I have some very strong feelings about that. I felt that there was an instance in which we were standing firm, but finally, in order to get an agreement, we retreated further than prudent judgment might have dictated.

Admiral BURKE. As you pointed out before, we were negotiating from strength. As long as we had that strength and were using that strength we were doing very well at the conference table.

As soon as we put self-imposed limitations on the use of that strength, we started losing the confidence.

Senator HUMPHREY. We expressed too much desire for an immediate settlement.

Admiral BURKE. Yes, sir.

METHODS OF PREVENTING SURPRISE ATTACK

Senator HUMPHREY. My position of believing in the importance of negotiations is quite well known. This morning a friend of mine called me around 8 o'clock and told me that he had read in the paper that we were going to have some hearings on the so-called Surprise Attack Conference.

He said:

> I just want to tell you that it worries me when I read about Senators and others saying that we must have a balance of strength with the Soviet Union because the truth is, since we are now talking surprise attack, that the United States isn't about to launch a surprise attack on anyone. If any surprise attack is to be launched it would be launched by the enemy or the Soviet Union, and because of that a balance before the attack means that there will be an imbalance or the United States would have weaker forces, after the attack.

His thesis was that the only way we can be sure that we are not going to suffer devastating blows is to have more than equality.

Admiral BURKE. Or to have a series of weapons systems which cannot be destroyed by a surprise attack.

Senator HUMPHREY. That is correct.

Another matter to which Mr. Foster directed his attention in the latter part of his remarks was the need for a diversification of systems and weapons so that we are not destroyed by attack.

RELIANCE ON NUCLEAR WEAPONS

In your statement you said:

> On the other hand, no country desires to become a nuclear battlefield, and in limited war we can expect there may be considerable political opposition to the use of nuclear weapons.

I think that is something which, while sometimes said, is not fully appreciated in terms of the seriousness of that possibility.

I am sure that our political leaders—our President, our Secretary of Defense, or our Secretary of State—who have to make broad overall decisions relating to the political situation as well as the military, may very well feel that in some kinds of limited action, if we became involved in such, we just could not use nuclear weapons. We felt this way in the Korean war.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. If that is the case, doesn't this impose upon you, sir, and upon others of your stature and importance in our defense setup, and upon the Congress, as well, a greater emphasis upon what are commonly called conventional weapons?

Admiral BURKE. Yes, sir.

It is very difficult to know what balance should be struck.

One of the things that we tried to do in the Navy, and I am sure it is done in all services, is to try to get as many weapons systems as versatile as they can be.

In other words, an aircraft that can carry nuclear weapons also carries conventional weapons. We put stations on the aircraft so they can do that.

An aircraft can carry rockets for closeup support of troops, in addition to carrying nuclear weapons.

But there is a tendency in our own service, that I am sure probably is true in other services. We have devoted a great deal of time to nuclear weapons, and properly so, but we have begun to rely on them, perhaps too much. When we went into Taiwan, the first reactions that our people had, were to prepare for a nuclear war.

Well, that was all right, I mean the small preparations that are needed locally. That was all right.

STATUS OF CONVENTIONAL WEAPONS

But we also had to start moving ammunition ships with ordinary iron bombs and ordinary rockets out there to make sure that they were ready, that we had enough of those. [Deleted.] But we are all apt to overlook the fact that there are going to be occasions in the future when all that we need is a good squad of marines, but that good squad of marines has to be there very quickly, and it has to be capable of operating with conventional weapons, and they have to be good conventional weapons.

I think we have good conventional weapons now, but we do not want to lose that capability.

Senator HUMPHREY. This does not sound like disarmament talk at this moment, but I have been somewhat concerned about the role that the Navy has had to play in the last two crucial actions on the part of our Government, in Lebanon and Quemoy, and the budget proposals relating to its needs in the future.

There is a Subcommittee on Preparedness that you will undoubtedly testify before, and I shall not go into details on this. However, one of the things that continually worries me, as a Senator and as a citizen, is that we keep making commitments in terms of mutual security or mutual security assistance. We keep saying to nations, "We will protect you; we will defend you. Join up with us." Yet, although we continue to expand our commitments, it does not appear to me that we are expanding our capacity to fulfill these commitments.

We keep stretching this band of security a little tighter and a little tighter to the point where it becomes almost translucent, and you can almost see through it.

AGING OF FLEET

I talked with Mr. Foster this morning about a study of our overseas bases. You may recall that in 1957 the Secretary of State said

that we were going to look into the number of overseas bases we had and whether we needed them all.

We still do not have the results of that study. I gather a report is being prepared. However, my concern as a layman, is that although we continue to commit ourselves, I do not see you getting very many new ships, Admiral.

I talked to a destroyer officer recently who was very worried about the quality of the ships that his force has, not that they were not kept up well, not that the morale was not good, not that the boys did not feel they could not give a good account of themselves, but because they are old. A ship that was built in 1942 and has been in more or less continuous service ever since may not be as good a fighting ship as it ought to be in 1959, particularly if it has to go around the world several times in order to put out some of these beachhead fires. That is just my opinion.

Admiral BURKE. Well, that is one of our most difficult problems in the Navy, our fleet is all getting old at once. It was all built during World II, or 81 percent of it. But now 81 percent of our fleet was built during World War II, and they are all aging at once, and we have run them, we have run them very hard.

Our fuel-oil consumption is up this year over what it was last year, which means greater operation. Our operating is just about the same, not quite, as it was during World War II. We are running them all the time.

Senator HUMPHREY. Obsolescence, Admiral, seems to me to approach unilateral disarmament.

Admiral BURKE. Yes, sir.

DISARMAMENT SHOULD BE BY SAFEGUARDED AGREEMENT

Senator HUMPHREY. The way to disarm is by mutual agreement. In other words, if one does it, the other does it, under systems of either mutual trust or mutual suspicion with a workable, feasible system of inspection. In this I am keenly interested.

However, I am more and more concerned about what I call unilateral disarmament through improper balance of forces. It does not do any good to have one kind of weapon, if that one is not likely to be of any use. Unilateral disarmament through obsolescence or through inadequate numbers of personnel and equipment is a serious possibility.

Admiral BURKE. Yes, sir.

DISADVANTAGE OF DEFENDERS

Senator HUMPHREY. Senator Long, do you have some questions?

Senator LONG. Thank you, Mr. Chairman.

Admiral Burke, you touched on this subject.

Since we are not going to start a war, we almost give our potential enemy a great advantage because he has a much better chance of achieving surprise than we do. In other words, a man who knows he is going to war has a great advantage, and if he plans it craftily enough there is a good chance that he can strike by surprise.

Would that be correct?

Admiral BURKE. Yes, sir; that is correct.

Senator LONG. In other words, he might reveal his intentions, but he might not, and you cannot really rely upon the fact that he might reveal his intentions.

Admiral BURKE. That is correct; and so you need to have a capability that even if he does you can make it so unprofitable for him that he has nothing to gain by starting that.

DISPERSAL OF FLEET

Senator LONG. Let me ask you something about this. I have seen some of your fine ships with wonderful officers and very well trained men, really devoted fighting men. However, I gained the impression that if I were the Soviet Union planning to strike the American people by surprise, I could just have a single man stand up there on the hills of Naples, to take the Mediterreanean as an example, and see how many ships you have there. He would see that most of the time your fleet is distributed at certain points, Naples, Villefrance, Barcelona or maybe Izmir, and that most of your fleet is tied up in that breakwater. It seems to me that if someone is planning a surprise attack, the same plane could fly to any one of these targets, depending on where the fleet is. If they were going to strike at dawn the next day, the night before they would try to find out if the ships are inside Naples.

However, if the ships can be kept at sea and kept maneuvering, an enemy cannot plan to find them like sitting ducks, can he?

Admiral BURKE. You are quite right, sir. For that reason there are no carriers in the same harbor in Europe.

[Deleted.]

Admiral BURKE. So that, although it is possible for something like that to happen, it is not nearly as easily done as it appears to be on the surface.

Senator LONG. I would not have liked the Chief of Naval Operations to know with how few men I operated my amphibious craft from time to time under various and sundry circumstances. I think if it had to be done we could get underway with one officer and one man. It could be done. There were many times when boats would be operated with no officers and two men. Of course that kind of operation cannot be sustained too long.

Admiral BURKE. No, sir.

DANGER OF SUBMARINES

Senator LONG. I have also been concerned a lot about the increasing possibility of submarines being able to surface at night and destroy a target.

SAC tells us about their fine planes and bases. They do have great capabilities and can move in 15 minutes. That is very fast. But although they talk about shifting their wings from one base to another, they require [deleted] bases for those wings.

[Deleted.]

Senator LONG. With that small a number of targets, if an enemy planned to hit [deleted] bases and if he caught them by surprise, he might get most of the SAC planes. Even if they do have the capabil-

ity of moving in 15 minutes, most of those planes would be subject to hits because a submarine-launched missile can travel so fast.

I assume you have capability along that same line, and have submarines around the world where the enemy could not possibly find them?

Admiral BURKE. We are in a very fortunate position, Senator, because the free world now controls the ocean, and we operate all over the ocean all the time, whereas the Russians do not control the ocean. They do not operate there. They do not have control of it. They do not have very many operating areas. They are concentrated in one place.

The possibility of a surprise attack by submarines is very great, and it is causing us a great deal of concern. [Deleted.] But we have forces at sea all the time, searching up and down both coasts. We have our various patrol squadrons that operate.

[Deleted.]

Senator LONG. Knowing the difficulties of finding submarines, could you perhaps keep enough atomic weapons on submarines so that if an attack were launched, the enemy could not possibly catch the submarines?

Admiral BURKE. That is right.

Senator LONG. Enough nuclear weapons could be stored at sea on submarines to retaliate with great destructive force.

Admiral BURKE. That, of course, is the philosophy behind Polaris submarines, sir. It is difficult for us to find those submarines with all of our capability, and it will be equally difficult for them. They cannot find all of them simultaneously, but they might find one. If they drop on one, that is an indication for all the rest.

CONTROL OF SUBMARINES

Senator LONG. If the enemy was worried about the positioning of our submarines with atomic weapons, then perhaps we could get an agreement with the Soviet Union by which we would from time to time identify the positioning of submarines.

This is the kind of proposal that occurs to me. It would be a reciprocal proposition whereby you could find out where a submarine was at 12:00 o'clock and where another one was at 2:00, and another one at 6:00.

Of course the submarines could move, but not so fast that they could go all across the ocean in 12 hours, or even 24. By such a system perhaps both countries could have greater security.

Admiral BURKE. Unless he lies.

Senator LONG. Yes.

One might even have a national on the submarine to identify its position periodically. I know that your people have thought about this matter.

Admiral BURKE. Yes, sir.

Senator LONG. Someone told us in a hearing some time ago that he thought that you had to have more than just the positioning of their submarines, and I would certainly agree that is correct.

Admiral BURKE. If you have the one man on the submarine, he gets his throat cut and you never hear of him again.

Senator LONG. Yes.

Admiral BURKE. So you have two men. And you would have to build up quite a few to make sure that one gets through. Then there is another and an even greater, more important factor, and that is, we do that to them, they do that to us.

SUBMARINE STRENGTH

Our strength now, our position of power now with these submarines is that no matter what he does, he cannot avoid being destroyed. He cannot avoid it. So that is where we have retaliatory strength.

When we get significant numbers of these over the ocean, then he cannot do anything we cannot do.

Senator LONG. How are you coming along with that?

Admiral BURKE. The first one is scheduled to be in full operation in the fall of 1960, and then they will follow through at the rate of, under the present budget, about three a year.

Senator LONG. That is very slow in terms of the race between this Nation and the Soviet Union, is it not, Admiral Burke?

Admiral BURKE. We asked for more, sir, but it is——

Senator LONG. It is all you could get?

Admiral BURKE. All we could get, yes, sir. But still it is a significant number. Each one of these submarines carries quite a few weapons, and it does not take very many of those weapons to wipe out a considerable area, and each one of these submarines will handle quite a few areas.

Then there is another aspect of this thing. When we get some of those submarines at sea, the Russians are not going to know which submarines are where, they are never going to know whether a submarine is a ballistic missile submarine, an ordinary submarine, or how many there are or where they are or their condition, or anything about them They will never know.

And if we have 10 submarines that are built, they will never know where 9 of them are; and every time they pick up a submarine contact, that might be a missile submarine, and the reverse is equally true.

Senator HUMPHREY. That is what I was just about to mention. The Soviets are not going to sleep during this period of time, are they, Admiral?

Admiral BURKE. No, sir. They are going to produce.

Senator LONG. I understand that they have about 250 long-range submarines. Do you think they have a considerable number of missile-carrying submarines?

Admiral BURKE. No, sir; I do not think they have a considerable number. I do think they have done considerable research in them, and I think they are probably doing most of their research based upon their land research data on ballistic missiles. So I think they could have ballistic submarines now. I do not think they have very many.

Senator LONG. If I understand it, your feeling is that it is of a tremendous advantage to the security of this Nation not to give away the positioning of our submarines, and you would be very reluctant to enter into an agreement with the Soviets giving away the position of submarines on a reciprocal basis unless there was an absolute, guaranteed, foolproof arrangement that the other side was not lying.

Admiral BURKE. And he could not cut the throat of our people who were there.

Senator HUMPHREY. That would be a bad assignment.

Admiral BURKE. Yes, sir; because the Russians have proved over and over again that they lie, and it means nothing to them.

I was in conferences in Korea where they lied, we knew they were lying, they knew we knew they were lying, and it did not make any difference. They went right ahead. Things that were obvious, I mean things that you could prove, physical things, and it made no difference.

REPUDIATING SOVIET PROPAGANDA

Senator LONG. Of course, it does seem to me as though this Nation should use more repetition of effective ideas. Mikoyan came to this country and repeated many times, "Why do you threaten us?" "Why do you let people make speeches about destroying the Soviet Union?" "Why do you let the ministers in Germany make speeches about destroying the Soviets?" They repeat their propaganda every time they get the chance. We should also repeat and repeat the truth about their lies, saying "Why do you keep telling this lie? Why do you keep telling that lie? Everybody in the world knows it is a lie. Why do you keep parroting that lie? We have exposed you on many occasions. People would not believe your word under oath." We should ask them that time and again.

Admiral BURKE. It would help.

Senator LONG. It seems to me it would help.

Senator HUMPHREY. I believe it would.

EXTENT OF SOVIET UNDERGROUND INSTALLATIONS

Senator LONG. There is one other thing I would like to inquire.

What is your guess on the extent to which the Soviets have built plants, installations, survival shelters, and other facilities underground?

Admiral BURKE. I think that they have put some plants underground, where it is economically feasible to do it. I mean they have not gone to tremendous efforts to do it, but I mean where it is feasible to do it, I think they have done it, particularly in the Urals. I think they will continue to do more and more, just as we are.

But as far as their missile sites, for example, I think we will find that some of their missile sites [deleted]. I think there will be a lot of dummies, too, that will be set up, and we will not know what is a dummy and what is not.

In other words, they will try to keep those missile sites in an unknown location. They will not be hidden, but we just will not know which is missile and which is not.

But as far as trying to put a significant number of their facilities underground, I do not think they have gone to great lengths on that.

NUMBER OF CASUALTIES IN EVENT OF NUCLEAR WAR

Senator LONG. If they did build a great many underground shelters, would there be any possibility that vast numbers of their people could survive an all-out hydrogen bomb attack on them recognizing what the fallout problem is like?

Admiral BURKE. No, sir. If we were to launch a retaliatory attack against Russia, large numbers of their people would die, no matter how many shelters they had.

Senator LONG. You say large numbers. How many do you mean?

Admiral Burke. Twenty, thirty, forty percent. Of course, it depends on what they do, the direction which their wind blows, how good their facilities are, how long they stay in their underground shelters, but there is a limit on the amount of time they can stay under, and a large portion will die.

Senator LONG. There is just no way to escape that?

Admiral BURKE. There is no way to escape that.

MUTUAL DETERRENCE

Senator LONG. Recognizing that we are approaching the date when we can each have at sea enough weapons almost to destroy the other, does it not appear as if we are approaching the date where neither side would dare to use hydrogen bombs on the other?

Admiral BURKE. I think we have reached that already, sir. I think they are convinced that we will not start a general nuclear war. I believe they are convinced of that. I think they are also convinced that if they start a general nuclear war, they have had it, they are destroyed, and both of us will have serious damage.

Senator Long. In effect, have we not already made a tacit, unwritten agreement that we are not going to have a war with hydrogen bombs by mutual recognition of the terrible consequences?

Admiral BURKE. Yes, sir, except that an agreement has been made with a congenital liar.

Senator LONG. It would be difficult to be a much bigger liar than Hitler, yet we had an understanding with him about poison gas and he did not use it.

Admiral BURKE. Yes, sir.

USE OF NUCLEAR WEAPONS

Senator LONG. Does that not indicate that, although we have to be ready with hydrogen weapons and prepared to fight an all-out war of extermination if the enemy wages it on us, the type of fighting we are most likely to do is the conventional type that we have done in the past?

Admiral BURKE. It would be a limited war; yes, sir. We may use small nuclear weapons in limited wars on certain occasions, too.

Senator LONG. Yes, sir.

Admiral BURKE. But there will be limited wars, too. I do not think that even a madman, particularly since he knows that there is nothing that he can do to avoid his country being absolutely destroyed, no matter how much revenge he wants, no matter what he wants to do, he cannot gain anything by it, so he will not do it. He and his country would be destroyed in the process of trying.

LIMITED WARS

Senator LONG. During the Korean war, people asked, "Why don't you use atomic weapons?" That is when it dawned on us that while we had been concentrating on preparation for an atomic war we had overlooked the fact that the most likely type of war was the very kind of action which took place in Korea. If we get into a position in

which we are not able to fight a limited war, is that not when the enemy is going to attempt that kind of war?

Admiral BURKE. Yes, sir; and he is about to probe, just as Mikoyan came over here probing, finding weak spots, looking for weak spots in our businessmen, finding any place at all where he thinks the United States is weak so he can drive a wedge in that would be military, political subversion, economic, every way possible. And when they find that weak spot, they are going to try to have the capability of taking advantage of it.

They haven't the capability now, perhaps, in all the ways, I mean in all aspects, but they will. I think they are going to try to get that capability. And when they do, they find a weak spot, they cash in.

Senator HUMPHREY. Operation Nibble.

Admiral BURKE. Operation Nibble, yes, sir.

POSSIBILITIES OF DISARMAMENT

Senator LONG. Here is the thing that concerns me. This is the Subcommittee on Disarmament, but we are confronted with a very substantial arms race, without any prospect of anything much different from that.

Do you see any prospect of achieving something, as far as your responsibilities are concerned, in the field of disarmament of the United States as against the Soviet Union?

Admiral BURKE. It is possible, sir. I do not see much prospect of it; no, sir. As Senator Humphrey said, inspection and knowledge of what the enemy is doing take the place of trust and confidence. We are not concerned about Canada because we have confidence in Canada; we trust her. We are concerned about Russia very much because we do not trust her at all. But if Russia wants to decrease tensions, the first thing she should know, and I think she does, is that she has got to create confidence in the rest of the world.

I think she is trying to. She is trying to put up a false front to create a situation in which we have confidence in her which is not deserved.

We have to watch that. That is the most dangerous thing there is. But I do not see much prospect of disarming by agreement. For example, if we could say let's everybody just cut half of everything we have, it is very difficult to arrive at that and to make sure that they do it.

Senator LONG. Yes. Any time the Soviet Union is threatening war or acting warlike, I feel more secure because my feeling is that the Soviets are not going to act belligerent when they really get ready to strike. If they ever decide to attack us, about that time they will act as if they were sweet and peace and light, just to get our guard down, and then they will hit us with all they have.

Thank you very much, Admiral Burke.

Admiral BURKE. Yes.

EFFECT OF TEST SUSPENSION ON NAVAL WEAPONS

Senator HUMPHREY. Admiral, the Chairman of the Joint Chiefs, General Twining, is reported to have said in the U.S. News last April, prior to the summer and fall series of U.S. nuclear tests: "Our defenses would be affected if atomic tests were to be stopped, as we would be

unable to proceed with desired improvement." He meant in nuclear weapons.

Would that statement be true today with respect to the Navy defense requirements?

Admiral BURKE. Yes, sir.

Senator HUMPHREY. Why do you say that?

Admiral BURKE. Because there are great prospects of increasing the yield and decreasing the size of weapons, smaller weapons, with greater yield. In Polaris, for example, we have a satisfactory warhead, but if the tests were to continue we could probably get a warhead weighing the same amount which will have two or three times the present yield.

Also, we would like to go into real small weapons. Take depth charges that could be fired from a [deleted] gun, for example. Some day you will be able to achieve that if testing continues.

But if you do not have a test, you do not know whether you have it or not.

Senator HUMPHREY. Is not military power always relative? There is no absolute in this because you are constantly measuring your strength against somebody else's.

Admiral BURKE. Yes, sir.

EFFECT OF TEST SUSPENSION ON NAVAL STRATEGY

Senator HUMPHREY. As you know, the President has said we would conduct no more tests for a limited time. If the present suspension of nuclear weapons tests by the United States is continued under an international agreement with inspection, would the defense strategy and the requirements of the Navy be affected?

This would mean not only that the United States would stop its tests, but that the Soviet would stop its tests, and the United Kingdom would stop its tests. It would also mean, I presume, that the international agreement would have an effective inspection system for otherwise we would not enter into such an agreement.

How would your defense requirements be altered or what would be your position?

Admiral BURKE. Well, everything would stay in status quo and we would still have a good capability with the weapons that we now have. If we were sure not only that there was an agreement but, as you point out, the agreement was effective, and they did not make any tests which we did not know about, which we would never quite be sure of unless we had a terrific inspection system, then we would still have, I think, a superiority. I think we are ahead of the Russians in our range of weapons.

Senator HUMPHREY. Have you ever made any specific requests for the production of small nuclear warheads which have been rejected by the Joint Chiefs or the Department of Defense or the Bureau of the Budget?

Admiral BURKE. No, sir. We made them and then requested them, and sometimes we have later canceled them ourselves where, on discussion, we find that we can combine several elements, several different requirements into one requirement. We have never had one refused.

36042—59—pt. 1——7

Senator HUMPHREY. The reason I ask that question is that we constantly hear that we need more tests for the advancement of small weapons. I heard this 3 years ago.

Admiral BURKE. That is true.

Senator HUMPHREY. Commissioner Murray appeared before this subcommittee 3 years ago and made a dramatic plea for the improvement of small weapons and for a diversified atomic arsenal. I have had a feeling that while the plea for small weapons was made very dramatically, the emphasis has been upon the large weapons, the massive, megaton weapons, at the expense of the more diversified small weapons. By small weapons I mean not only small bombs but small shells, for example. I do not know all the different categories of weapons.

Admiral BURKE. Yes, sir, that was true, and probably correctly true, at the beginning. When we first got atomic weapons, we concentrated on getting bigger yields, and that was probably a good idea at the time.

Then we got a lot of big-yield weapons and we started to shift the emphasis to smaller yield weapons, and it was because of the advance in the last couple of years in small-yield weapons that we were able to build the Polaris. That is, a warhead which was small enough to be launched with the power we could get with the solid propellant.

Senator HUMPHREY. You have made very substantial progress in this, Admiral.

COORDINATION BETWEEN ARMED SERVICES AND ATOMIC ENERGY COMMISSION

Admiral BURKE. Yes, sir. There is very close cooperation between the AEC and the military services. When the AEC tests are completed, all of our military people and the AEC together study what the significance of those tests was. Just what do they mean, what can we get out of them. From this we then submit our weapons requirements, which stem basically from what the AEC has been able to do.

We reach a little bit further than the AEC has gone. Perhaps we can get a clean small weapon or a weapon of special use [deleted] or something like that, and then the requirement is submitted. Because there is such close coordination, there has been no request for small weapons that has not been met.

Senator HUMPHREY. In other words, the policy of the Navy with respect to the development of small weapons is to push forward on them, is that right?

Admiral BURKE. Yes, sir, the smaller the weapons the better we like it.

NAVAL VIEW OF CLEAN WEAPONS

Senator HUMPHREY. What is your policy for the development of the so-called clean nuclear warheads?

Admiral BURKE. We push that, too, sir, because there are many occasions, conceivable occasions, that we would want to use a weapon without much fallout close to our own forces, and a clean weapon would be usable and a dirty weapon would not.

POSSIBILITY OF COMPENSATING FOR TEST SUSPENSION

Senator HUMPHREY. If we had a test suspension, and if nuclear warhead development were impeded as you indicated you think it would be with a test suspension, could that impediment or that slowdown be compensated for by developments in other weapons areas, such as better propulsion and guidance, for example?

Admiral BURKE. Probably not, sir, because simultaneously with this, propulsion and guidance are going ahead anyway. I mean that improvements in accuracy and delivery capability are going ahead anyway, and there would be one element that would not go ahead, and the other elements I do not think could go ahead fast enough or that much further to compensate for the lack of improvement in the warhead itself.

Senator HUMPHREY. Dr. Hans Bethe testified before this subcommittee a year ago that had we been able to have obtained from the Soviet Union a test suspension agreement in about 1953, at the time that the Soviets first proposed it when we rejected it as national policy, we would have been so far ahead of the Soviet Union in weapons sophistication, weapons variety, and weapons effectiveness that the Soviet would most likely never have been able to catch up. Whether they meant that proposal in good faith in 1953, of course, is neither here nor there now, because we rejected it out of hand.

Dr. Bethe testified—and he is a competent authority as you know—that the Soviets were so far behind and we were so far ahead in weapons technology at that time, that had we been able to have gotten such an agreement, it would have been a tremendous asset for us.

Since that time, however, the gap has closed somewhat. The time factor has not always been on our side on weapons development. They have moved forward quickly in closing the gap, in part because they have gotten the benefit of accumulated research.

There are those who argue that the longer test suspension is postponed the more the Soviets have the chance to catch up with us on weapons diversification and weapons sophistication. Another aspect of this concerns propulsion and guidance. It appears from what we hear, and again I am only a layman speaking from what we hear, that the Soviet is far ahead of us on propulsion and that they apparently are equal or ahead of us in guidance.

If that is the case, then it might be that there is an advantage in our getting a test suspension while we still have free and open opportunity to improve our guidance and propulsion.

Admiral BURKE. Under those conditions, that could very well be, sir.

The Russians do have, obviously, a very good propulsion unit. How big it is, I do not know. It may be that they are doing it with brute force. Maybe they are not.

We have made some significant improvements in our propulsion within recent weeks. I mean that we are on the track now of making a significant improvement in the specific impulse of our solid propellants. Well, we could continue on that.

All that gives you, though, is the ability to carry more weight or longer range, and that is pretty good.

Our accuracy is going to improve considerably as time goes on. That is bound to. We expect to have ballistic missiles which will use

all inertial guidance. What one service or what one laboratory improves, the others use immediately, and the accuracy will come down [deleted].

Senator HUMPHREY. The point I am trying to develop here, Admiral, is not for purposes of argument but for purposes of observation. If all that Members of Congress have heard about our superiority in atomic weapons is true, then it would have been, it seems to me, to our advantage to have been able to call a halt at any one time to the development of those weapons.

Admiral BURKE. That is true, sir, and I believe it is correct if you can insure that you actually do call a halt.

POSSIBILITY OF EFFECTIVE INSPECTION SYSTEM

Senator HUMPHREY. What you are concerned about, in other words, is essentially the efficacy of the inspection and control system.

Admiral BURKE. Yes, sir. I do not trust them, and I want to make sure——

Senator HUMPHREY. I do not trust them, either, but I think it is terribly important that we keep in mind the subject of developing the inspection and control mechanism, not only because of the weapons race, but because an effective inspection and control system would be installed inside the Soviet Union as well as the United States, and that would be a political breakthrough.

CONTROL OF PROPULSION DEVELOPMENT

Senator LONG. Senator Humphrey, I would like to make a suggestion at this point. It seems to me that as far as rocket propulsion engines are concerned, it would be very foolish to enter into an agreement to remain static because it would be impossible to have proper inspection.

There is a good chance of knowing when an atomic bomb or a hydrogen bomb has been exploded. However, a center to test propulsion engines can be built underground. For that matter, it is easy to hide them anyplace, so you would not even want to consider an agreement on that, would you?

Admiral BURKE. No, sir; because we entered into a naval agreement, you know, and we got rooked.

Senator HUMPHREY. We were rooked with our eyes wide open, Admiral. We deserved to get rooked. You know there is such a thing as getting rooked because you just do not know what is going on, and there is another thing of knowing what is going on but doing nothing about it.

Admiral BURKE. Yes, sir; but not twice.

Senator HUMPHREY. I agree with you. As a lad I wrote a paper at the university on the Washington Naval Conference. Under the Washington Naval Agreement we had indications that the Japanese were violating it.

Admiral BURKE. Yes.

Senator HUMPHREY. Franklin D. Roosevelt loved ships, so when he was in office we got more ships. Roosevelt happened to be a seagoing man, and the Navy was very lucky.

I agree with you that we should not want to enter into a second treaty that bordered upon what I call sacrificing national security.

STOCKPILING OF FISSIONABLE MATERIAL

Recently there was a press report that the Department of Defense had made a policy decision to recommend a substantial increase in the production of plutonium, which is particularly suitable for the small nuclear weapons.

According to the dispatch, the decision was motivated by the desire to have an adequate supply of plutonium on hand for present relatively inefficient weapons in case a nuclear test suspension agreement went into effect.

Is this dispatch essentially correct?

Admiral BURKE. We did recommend an increase in plutonium, but not for those reasons. The reason was that you need a greater proportion of plutonium in smaller weapons.

Senator HUMPHREY. Yes.

Admiral BURKE. And so we needed more, and also in the production of such elements as tritium, which does decay fairly rapidly, the half life is comparatively short, you need a greater manufacturing facility to keep your weapons up.

Senator HUMPHREY. You were really doing some stockpiling?

Admiral BURKE. Well, or to put more of our production into smaller weapons.

Senator HUMPHREY. Or to be able to put it into smaller weapon designs which had already been tested.

Admiral BURKE. Yes, sir.

Senator LONG. If the Soviets had accepted our proposal in 1946 for atomic control we would have really been fooled. It took them from 1946 to 1949 to fire their first shot, and until there is an explosion, there is no possibility that an inspection system could detect an effort to manufacture nuclear weapons. We would have been disposing of our stockpile and they would have been accumulating uranium just as fast as they could, and in about 1949 they would have had a nuclear test. We would have said "We have evidence that you exploded a nuclear weapon," and they would have replied "That is not true" just as Mikoyan told you about those nine servicemen who were shot down, "That is not true, Senator; it is just not true."

Then, after they had conducted about 15 or 20 tests we would have said, "As far as we are concerned, the deal is off." By that time they would have gained about 3 years headway. They would have screamed to high heavens when we started testing again. It would have been very difficult to convince the rest of the world a resumption of tests was right and they could have probably gained several years on us if they had taken us up on that original proposal.

Chamberlain at Munich made a gentleman's agreement with Hitler. The only trouble was that Hitler was no gentleman.

IMPORTANCE OF LOW-YIELD WEAPONS IN ANTISUBMARINE WARFARE

Senator HUMPHREY. How important are nuclear warheads of low yield in the antisubmarine warfare program?

Admiral BURKE. They are very important, sir, because we now have two nuclear warheads. We want to get a warhead that will fit onto a [deleted] gun that we can fire to get range for an antisubmarine weapon. We also want to get a low yield lightweight warhead which can be dropped from helicopters. [Deleted.]

So it is quite important to us. But we do have nuclear warheads now that we can continue to use.

Senator HUMPHREY. Do you have many other plans in mind which would require testing in the field in order to fill out your arsenal?

Admiral BURKE. Yes, sir.

Senator LONG. Why do you think you need nuclear warheads on a [deleted] gun for antisubmarine work? [Deleted.]

Admiral BURKE. Yes, sir. If we could pick up a submarine on our sonars and if our identification devices were sufficiently accurate so that we knew positively that we had a submarine [deleted] then the thing is to get a destructive device on him quickly.

We have several things that are coming along. One is a drone helicopter on the stern of a destroyer, which probably will turn out to be a jet device. We launch that, it takes considerable time to get over and drop an atomic depth charge, and it probably destroys this drone in the process.

Another way is to have a rocket-launched depth charge which is in our ASROC, and that is being designed now. If we could get a grenade device to hook onto our [deleted] guns, it would be a lot cheaper and easier, and we could use it with our present equipment.

Senator LONG. If you were using a rocket, you could have a long range; could you not get a longer range than the [deleted] gun would have?

Admiral BURKE. You could, sir, but it is quite a bit more expensive. [Deleted.] To have a separate launcher, what we are trying to do is develop a way to use our present gun platforms and fire control equipment without putting more expensive equipment in the ships.

Senator HUMPHREY. Before we have a hearing like this, Admiral, we try to look over previous statements of yours and others in the Department of Defense and develop a series of questions which might be of some use in eliciting more information from the witness.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. You have testified very generously here and very frankly.

Senator LONG. Could I just ask one more question on the [deleted] weapon you are working on. If an atomic bomb were exploded 5 or 6 miles from a destroyer, it would receive quite a jolt, would it not, Admiral?

Admiral BURKE. Yes, sir; a jolt, but not a significant one for the kind of yields we are considering. However, we still need to know the range at which a significant jolt would be received. This is a sensitive point on why we want to continue our tests. We know the lethal range of an atomic weapon pretty well at various depths from our underwater tests. That is, we know pretty accurately whether a submarine at 300 feet depth, at a certain number of feet from the center of an atomic weapon that explodes [deleted] underwater will or will not be destroyed. We have got that marked out. But we do not have enough data on how far our own ships should be away from that explosion in order not to get operational damage, in order not to break a pump or something like that.

Now we have rough data. It shows these ranges to be considerably less than 5 miles. They are in the order of 2,000 or 3,000 yards. We do not know exactly, and we would like to find out.

Senator LONG. You mean a ship 2,000 or 3,000 yards away would not be destroyed, but you cannot say that it would not receive operational damage; is that it?

Admiral BURKE. That is correct, sir. It is the operational damage data that we do not have enough of; yes.

Senator HUMPHREY. The Navy has enough old ships to try it out on, Admiral.

Admiral BURKE. Yes, sir.

OLD AND NEW NAVAL VESSELS

Senator HUMPHREY. I am not complaining about the way you take care of the ships, Admiral. I do not want you to think that, because I have already personally expressed to you my high regard and admiration of you as an admiral and as a man and as one who knows how to take care of what he has. However, I am worried about the failure of this Government to supply to you, as the head of our Navy, adequate equipment. I am not happy about what I think is a dereliction in providing modern equipment.

Admiral BURKE. It is quite difficult to keep these old ships operating.

Senator HUMPHREY. It is, and I think it is very expensive. Moreover, if you are going to get submarines which can operate as fast as I understand these new submarines can operate, you are going to have to have destroyers which are pretty fast.

What is the class of that destroyer, about 1944, which you are lucky if you get?

Admiral BURKE. Twenty-two hundred tons.

Senator HUMPHREY. What speed do they have? On some test runs do you make 30 knots, 33 knots?

Admiral BURKE. Yes, sir. I think they will all go about 30, 31 knots, but their original designed speed was 33, 34 knots.

Senator HUMPHREY. Some of these new submarines will go very fast.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. Even submerged.

Admiral BURKE. Yes, sir.

[Deleted.]

Admiral BURKE. That is why we are developing these longer range weapons, so if we pick them up we can destroy them no matter what the range is.

WEAPONS IN LIMITED WAR

Senator HUMPHREY. What kind of weapons, nuclear or conventional, does the Department of Defense think will offer the best prospects of keeping a war limited or being of most use in a limited war? How well prepared is the Navy to help defend free countries or keep our commitments against limited aggression in terms of nuclear and nonnuclear capabilities?

Admiral BURKE. Of course, it depends upon the circumstances, and you can envisage different kinds of circumstances for even the same part of the world.

In the Taiwan Straits episode, for example, in which we applied force very quickly, we were prepared for the use of either conven-

tional weapons or nuclear weapons. As this situation generated, we sort of abided by rules of the other side, and they abided by our rules. They were very careful never to come out to sea, beyond their own coastline. We were careful not to go beyond their coastline, too, so that we sort of had an unofficial agreement and nothing happened.

Senator LONG. How are you defining their coastline? Are you defining it by their rules or our rules?

Admiral BURKE. They have illegal rules, sir. Three miles. We stayed beyond the international limit of 3 miles, which is——

Senator LONG. As you know, this new Norwegian law of the sea lets them draw their own coastline.

Admiral BURKE. Yes, sir. That is very bad, and if that is accepted by all the nations, it is going to restrict not only us but all the nations, but particularly will it restrict those maritime nations.

INTERNATIONAL AGREEMENT CONCERNING TERRITORIAL WATERS

Senator LONG. On the baseline problem, however, did we not accede to the agreement that was filed with the United Nations?

Admiral BURKE. We made a proposal, sir, which was not accepted, and just what the status of that proposal is now, I do not know.

Senator LONG. Who was the Navy captain who was your military adviser at that conference?

Admiral BURKE. Admiral Colclough, the head of George Washington University.

Senator LONG. He did a very fine job, by the way, in representing you there. However, we did not do well on the baseline issue, from your point of view.

Admiral BURKE. Yes, sir.

Senator LONG. You wanted the territorial waters as narrow as you could get them, and you wanted those baselines as short as you could get them. Instead, we wound up with a Norwegian baseline system which lets them draw a line at almost any rock and crag, as long as it does not depart too much from the general direction of the coast. In other words, the agreement incorporated the Norwegian fisheries decision, whereas we had some hopes of confining that principle to just the special, limited circumstance of Norway. Instead, we ended up with the right to do that in all places.

The baseline is permissive. I suspect we are going to find that as it stands right now, however, it is already international law, just because the majority of the nations agreed to it. I believe they got the two-thirds agreement on that part.

What they failed to get the two-thirds agreement on was the width of the territorial sea. We were trying to hold it to three, but we had to go to six.

Senator HUMPHREY. Some wanted 12.

Senator LONG. We wanted fishing rights for 6 miles beyond that 6, but could not get that. The Soviets wanted the 12.

Admiral BURKE. This whole thing is going back into another conference about March or April 1960, sir.

Senator LONG. Yes.

Admiral BURKE. What we are trying to do is to get the issues broken out and more clearly defined than we had last time. All the

nations got mixed up between fish and sovereignty, and now we are having briefing teams that are going down to Latin America and other nations trying to explain what this means to them.

(Discussion off the record.)

ROLE OF NAVY IN DISARMAMENT DISCUSSIONS

Senator HUMPHREY. I have a final question to ask you.

To what extent has the Navy been called upon to help develop or to evaluate proposals for arms reductions and control?

For example, what has been the role of the Navy in recent international negotiations on disarmament, on the nuclear test suspension conference and the surprise attack conference?

Admiral BURKE. Directly very little, sir; indirectly, quite a bit, because we do make most of our contributions through the Joint Chiefs of Staff, and the Joint Chiefs are asked before these conferences for their views on policy and what should be done, and those are submitted. That is before the conference starts.

Now, during the conference we contribute a great many people, that is naval officers, from the Joint Staff, from other joint agencies, and also directly from the Navy.

Mr. Foster had a lot of people from all services in his staff, and those people, as individuals, contribute. Since they know about the Navy, they can contribute quite a bit from a naval point of view, and so do the other services, too.

In these conferences that we have had with Russia, we had, of course, General Weyland from the Air Force who was directly on the negotiating team, and we had three officers, one from each service, as advisers on that team.

These three officers were not there from a service point of view, but because they had had experience in their own line, they knew that particular subject, that particular method of warfare.

There were never, practically, any differences of opinion among the military people as to what should be done.

No service angles entered into it at all. There was particularly good collaboration in that respect because they all had about the same sort of views.

So, for that reason the Navy viewpoint and the other service viewpoints are very closely together.

It is true that we have problems on what will happen at sea that the other services do not know about, and they have problems with which we are not so familiar.

SURPRISE ATTACK BY SUBMARINES

Senator LONG. I want to ask a question in that connection, Admiral Burke.

There was a very good Air Force base commander who told me that while he was in the Philippines he felt he was in position to pick up radar warning in the event of air attack, but he never was confident that his counterpart in the Navy was in any position to protect him against sub-launched missiles. In other words, he felt he was a sitting duck for that weapon.

What is your reaction to that type of situation? You have a naval base in Puerto Rico, and you have some Far Eastern bases right on the sea.

Admiral BURKE. Yes, sir. There will be no way that you can absolutely guarantee that an attack will not get through. If they would concentrate on such type of an attack some of it would get through.

Senator LONG. The point is that you just do not have any way of being sure that that type of an attack cannot be made.

Admiral BURKE. No, sir. There are thousands and thousands of square miles of ocean, and looking over the ocean you can only cover a very small area at any one particular time. There is no equipment that can guarantee that there is not a submarine at a particular spot in the ocean, except in a very small area, and even then you cannot guarantee that you have got it.

Senator LONG. That is a lot of area, and the Soviets can have a missile with an accurate range from, say, 300 miles away, too; is that not possible?

Admiral BURKE. Yes, sir. That is for the same reason the Russians are in a tough spot on that. There is no way that they can search all the oceans either. There is no way of doing it, and it is more true for submarines, but it is equally true for surface ships. There is a tremendous area that has to be searched all the time.

Senator HUMPHREY. The thing that worries me about this, Admiral, is that we are much more of a maritime nation than the Soviet Union. We are much more vulnerable to attack because of the miles of coastline that we have as compared to the Soviet Union.

The Soviet Union has no coastline except the Pacific; that is Siberia and Vladivostok.

They use that area for missile testing sites, for maneuvers and war games activity, all the way up to the Pacific side.

Of course, there is development of the seacoast, as such. But submarines would have a rather difficult time making much of a missile attack on the Soviet Union. [Deleted.]

Admiral BURKE. It would depend upon the number of submarines we wanted to place and where we wanted to place them. [Deleted.] The Arctic Ocean is a very good place because there are holes in the Arctic ice, and you can put a submarine into the holes and it launches through them or it can come up next to the coastline and it is very difficult to detect.

Senator HUMPHREY. But the major population centers of the Soviet Union are far from there, are they not? I am not an expert in this, but I have been looking at that map and studying about Soviet geography and industrial complexes. Let us say you ran a submarine right up there in the area up around the Norwegian tip that comes around and butts into the Soviet; would you hit Murmansk?

Admiral BURKE. Yes, sir. But you could hit Murmansk much further away.

You could cover with 1,500 miles, you can cover all but a very small part of Russia from launching positions at sea.

POLARIS

Senator HUMPHREY. Would you be able to have missiles that shoot 1,500 miles?

Admiral BURKE. Yes, sir; yes, sir.

Senator LONG. That is Polaris.

[Deleted.]

Senator HUMPHREY. What about this Polaris missile? Do we really have one?

Admiral BURKE. No, sir; we do not have one yet, but we started several years ago, sir, on this, and we are right on our schedule.

We have had troubles, but less trouble than we anticipated. We have solved a good many of the problems faster than we thought we would. This is the reason why we could advance the date, why we have cut off a couple of years on the thing. We have the propellant problem solved. We have our guidance system solved.

We have had four test vehicle shots, that is Polaris test vehicle shots. None of them were completely successful, but in the last two we found out what happened, so that we know how to cure that.

The next one will not be completely successful either, but no missile is wholly successful in the first couple of dozen shots.

I mean you will always find little things that are wrong, but we have a higher level confidence in the missile system than we had a year ago. There is nothing that we can see that is going to cause us any serious difficulty in solving.

We know we will have troubles. We do not know where they will be, but there is nothing right now that is causing us any trouble for which we cannot foresee a possible solution.

Originally, we thought we would have a great deal of trouble in controlling the beast in flight, I mean the thrust control mechanisms in the missile itself. [Deleted.]

We went into the miniaturizing of inertial mechanisms so that they would fit into a missile and take the beating that it gets in a missile. They all work.

The warhead reentries have been tested; they all work. We thought we would have a lot of trouble with launching from submerged positions. We never did have any trouble on that. We were very fortunate at first. We thought we might have to launch from the surface; we did not. We have no trouble at all from submerged launching.

FIRING FROM SUBMERGED POSITION

Senator LONG. Does it really make that much difference, if you have a 1,500-mile range in your favor? So it is not essential that your submarine be surfaced in order to shoot?

Admiral BURKE. No, sir; we don't have to surface.

Senator LONG. Is it much of an advantage to you that you do not have to?

Admiral BURKE. Yes, sir.

Senator LONG. If you have a 1,500-mile range in your favor?

It would seem to me as though with all that sea out there it might be able to surface.

Admiral BURKE. It does not make a whole lot of difference except you do not have to come anywhere near the surface now. You fire

submerged. It is nice and easy and all they see is the missile coming out of the water, and that is very fast.

Senator LONG. Yes, sir.

Admiral BURKE. But this Polaris business can some day in the next year or so be put on surface ships. That is another danger from Russia, not only from submarines, but they can put these ballistic missiles on surface ships. It is just the same as we will not know where their missile locations are in Russia. If they are wise at all, they will have a lot of false missile sites to fool us. They will also perhaps have missiles in surface ships. If they put missiles in a surface ship, we will not know which one has them.

COORDINATION OF DEFENSE CUTBACKS WITH DISARMAMENT NEGOTIATIONS

Senator HUMPHREY. Admiral, one of the things which disturbed me when I was in Europe last November, right around the time when the Berlin crisis arose, was that all the big news stories coming out of the United States and out of Washington said, cut back on defense budget, defense budget to be cut, cut back this, cut back that.

Well now, I am not fiscally irresponsible. I realize that we need to watch the budget, and that there are certain limits to what any country can do. However, that was the most unfortunate kind of publicity at that particular time.

I could sense it in my visits to people in other countries. Responsible foreign officials, the same officials who might be critical of many of the things that we want to do, get very worried when we start to cut back too much.

They may think we are a little too tough, a little too aggressive, or too intransigent sometimes, but the minute we start to wobble and get a little soft then they really get worried.

They feel that they can afford to talk a little bit against us as long as we are strong. These are our best friends I am talking about now.

Admiral BURKE. Yes.

Senator HUMPHREY. One of the things that has always seemed a possibility to me is to coordinate our manpower cutbacks with our disarmament negotiations. Let us assume that we decided as a matter of national policy that we were going to reduce the Army by two divisions, the Navy by a hundred thousand men, the Air Force by a certain number of wings or a certain number of men, and that this is a very secret calculation that you make a year ahead of time insofar as your budgetary planning is concerned.

Why don't we initiate some discussions with the Soviet for limited disarmament on the basis of those cutbacks that we are going to carry out anyhow?

For example, you have already started your preparations for next year's budget for fiscal 1960.

Admiral BURKE. 1961.

Senator HUMPHREY. You have to have a lot of prophetic vision and wisdom.

I gather we must have some prophets in the Bureau of the Budget. You have to have a lot of vision to see into the future. However, I suppose we do know fairly well right now what the general estimates are in terms of manpower and facilities in the Defense Establishment,

and unless there is some unusual development, what we are going to ask for next year in broad terms.

Instead of going to a conference with the Soviets and arguing about things on their terms, why don't we start conferences wherever we can by saying, "We are not getting very far in the disarmament picture. The world is hungry for some kind of indication of lessening of tensions." There is tremendous world pressure for a lessening of tension, as you know. If we offered to negotiate a cutback of 1 percent and we were planning to make that much of a cutback anyway, we wouldn't lose anything, but we would get the initiative psychologically.

I have been disturbed for a number of years by our practice of making cutbacks in manpower in such a manner that, to many of the folks in our country and elsewhere, it appears to be a reduction of military power.

We can say that qualitatively we are better, and we have more firepower. But hundreds of years of tradition have related military strength to ships, manpower, or planes, that is, numbers of instruments and, particularly, men.

It seems to me that we would be very well advised if, instead of announcing immediately after a preliminary discussion within the executive branch that next year we are going to reduce the Marine Corps or the Navy or the Army, we started immediately, through our political officers, our State Department officers, our U.N. officers, discussions with the Soviets on the possibility of an agreement for limited manpower reductions, knowing full well we are going to reduce our manpower anyway.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. We would have nothing to lose, and we would gain a psychological and political initiative.

DIFFICULTY OF LONG-RANGE PLANNING

Admiral BURKE. There is a tremendous advantage to that, sir. But the whole Government is so wrapped up in immediate problems——

Senator HUMPHREY. They had better get unwrapped.

Admiral BURKE. That is all of us, that we never get far enough in our advanced planning so that we can have any confidence in our own advanced planning.

We have trouble with that in the Navy in making plans for any length of time.

We have 5-year objectives, which we do planning as far ahead as we possibly can, but we cannot have a great deal of confidence in that.

It is a goal, a thing toward which we strive, and we can change it and we change it every year, but the immediate problems are always upon us. That is why we have established that small group in the Navy Department for these Russian negotiations, not only disarmament, but to be the experts on Russia, long-range people.

DEFENSE DEPARTMENT ORGANIZATION FOR DISARMAMENT NEGOTIATIONS

Senator HUMPHREY. I wanted to ask you about that. You do have such a group?

Admiral BURKE. Yes, sir; we just started about, well, when Mr. Foster's group first was formed.

Senator HUMPHREY. Do you pool that with the Department of Defense?

Admiral BURKE. We have a group in the Joint Chiefs of Staff, and we have a group in the Navy because you can never tell what emphasis various things might take.

They are not large. Our groups are quite small. They will study disarmament negotiations, all the negotiations with Russia, to see how they negotiate, to see what the meaning of their words are.

We put a negotiating team over there with Mr. Foster, and Mr. Foster is one of the finest men I know. He does not know very much about negotiating with the Russians compared with what they know about negotiating with us.

Men like Mikoyan—Mikoyan himself is not the dangerous man, it is his interpreter, a brilliant young man, who has already had more years of experience in negotiating with the United States than most of our people.

We are trying to build up a background which will take years to do, but some day we ought to have a group of officers who know that, who know the entire meaning of their words.

When the Russians say peace, we know very well the Russians mean Communist domination. So that they instinctively react to the Russian words the way the Russians react to their own words.

Senator LONG. Admiral Burke, if you are going to do that, you are going to have to take some good naval line officers and make them stay in the negotiating business, are you not?

Admiral BURKE. No, sir.

On the contrary, it is, I think, the other way. An officer has got to have about five or six different qualities. One of them, he has got to be technically proficient.

Another one is he has got to know foreign people. He has got to know international relations; he has got to know staff work, and he has to have the ability to write and express himself and know what the other services are doing; how to get along with them, what their peculiarities are, and how they react to our peculiarities, and they also have to have a seagoing experience; I mean seagoing experience. They have to know all of those.

Within that general knowledge certain officers will emphasize the Russian business, for example, but they wouldn't be useful on this Russian business if you did not have also some pretty good missile people in there, good technical knowledge of missiles.

Senator LONG. Correct.

Admiral BURKE. And periodically they go to sea.

QUALITY OF BASE AGREEMENTS

Senator LONG. That reminds me of something that I am glad to have the opportunity to mention to you. I would be glad to put this on the record or say it on the Senate floor.

Senator Wayne Morse and I made a trip in 1952 around the world inspecting bases. I think we were on most of the military bases in the United States and the North Atlantic and the European area.

I climbed up and down every control tower and looked at all the bases. We had three good engineers with us borrowed from the

services, one from the Navy's Yards and Docks, and two from the Army Engineers.

These men had helped build the very type of things that they advised us on. We investigated to see whether maybe some reduction or saving might be made somewhere.

One thing that impressed us was the horrible base agreements that we had. The base agreements negotiated by the State Department were absolutely disgraceful. The only good base agreements were the ones in which the service had negotiated its own base arrangements, for example, the arrangements at Port Lyautey were much better than at bases for which the State Department negotiated for the Air Force.

Do you still have that Port Lyautey base there?

Admiral BURKE. Yes, sir. It is a good base, now—when we talk about the bases in Morocco they talk about all the bases in Morocco.

Senator LONG. That was an agreement with the French.

Admiral BURKE. Even with the Moroccans, which they accepted very well, because it was a fait accompli. It has been built up over a period of years.

But they assume that all the bases are identical, so what happens to the Air Force bases there will also happen to our base, probably.

This is an interservice thing because in Italy the Army has some very advantageous arrangements, but it is bad to treat things all alike sometimes. Sometimes it is good to have differences.

Senator LONG. Is the $40 million payment to the Moroccan Government supposed to be a payment for these rights at Port Lyautey as well as those rights at Nouasseur and Sidi Slimane?

Admiral BURKE. I think it is just a payment to the Moroccan Government for bases.

Senator LONG. In other words, that was their price?

Admiral BURKE. Yes, sir.

In fairness to the State Department, sir, the Lyautey base agreement was negotiated at a very low level of negotiation much earlier. We did not want very much, and we did not get very much, but what we got was good. It was a small operation instead of a great big one.

Senator LONG. Yes.

But I found the same thing through place after place, for the Air Force, the Army, and the Navy. The services knew what they had to have and what they could afford to do for it, so they got good agreements when the base commanders sat in and had something to say.

ARRANGEMENTS FOR BRITISH BASES

But look at our Air Force agreement with the British. We were so anxious to build those Air Force bases for the British that they started out with an agreement that to make the old bases available, we would put up 60 percent and they would put up 40 percent of improvement costs. That concerned the first 10 bases.

Without ever getting any agreement on the rest of the bases, they proceeded to go right ahead and say, "There will have to be some arrangement about the costs. We have no idea what it will be."

The last time I looked at it, it looked as if, because we had not gotten an agreement before we went in there and started sending our money in, on the second part of our bases, the British were required only to put up 10 percent.

Admiral BURKE. I am not sure.

Senator LONG. It is an Air Force matter, and you probably would not know anything about it. But whereas on the first round we had gotten 40 percent, on the second round of bases it was about 10 percent.

If we had not been so anxious to spend our money before we had an agreement, we would have been a lot better off.

I do think that on these base agreements, a much better arrangement is made when the services negotiate their own.

Admiral BURKE. Yes, sir.

COORDINATION OF MANPOWER REDUCTIONS WITH FOREIGN POLICY

Senator HUMPHREY. I wanted to follow up on the matter I was talking about a moment ago.

Was any consideration given as to the effect that these cutbacks in defenses might have on our foreign diplomatic moves, our commitments, or our negotiations on arms control?

I am assuming from my own brief analysis of our defense structure that there have been some cutbacks, if only in terms of manpower and ships, in the instance of the Navy.

Admiral BURKE. There was a great deal of consideration given to the effect on our international relations.

For example, the number of divisions that are left in Germany or in Korea, there is a lot of thought that was given to that.

As far as the Navy is concerned we have commitments and customs that we have been doing, and we could not cut back below certain minimums.

NECESSITY OF ADEQUATE FORCES

Senator HUMPHREY. What would have happened, Admiral, if you had more trouble in Lebanon at the same time that you were attempting to move and to strengthen the Far East in the Quemoy area?

Admiral BURKE. We were stretched pretty thin, sir. If we had required all of the forces which we were prepared to use as reinforcements and, if those had been required on-station for any length of time, we would have had to put other ships in commission.

Senator HUMPHREY. And that takes some time?

Admiral BURKE. That takes some time; yes, sir.

Senator HUMPHREY. Of course, the timing of your operations is very important, is it not?

Admiral BURKE. Yes, sir.

Senator HUMPHREY. I am of the opinion that, regardless of what peoples' views might have been prior to the decision to send forces into an area—some of us had different points of view about this—once the decision was made to send forces into an area, speed of action was required. If you could not have moved with alacrity, if you could not have moved rather swiftly, if you had been impeded by action some place else, you would have weakened your position a great deal; is that not correct?

Admiral BURKE. Yes, sir. That is what happened to the British in Suez.

Senator HUMPHREY. That is exactly right.

Admiral BURKE. Yes.

Senator HUMPHREY. It seems to me that we have to be prepared at all times to handle at least two of these operations.

I think we were given a little forewarning of what might happen. That is why I am stressing this.

A situation like Lebanon is going to happen again. Perhaps it will happen in the Persian Gulf or in Iran or in Iraq. Whether we will become directly or indirectly involved, I do not know, but something is going to happen in the Middle East.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. At the same time, the situation in the Far East has not been settled at all. The more difficult the Philippine situation becomes, the more opportunity it offers to the Chinese Communists to again flare up in the Formosa area because we are somewhat off balance. I keep asking myself, have we learned from these lessons?

I think it is fair to say that if there had been open fighting in the Lebanon-Iraq area when our military forces were committed to that area, as the Chief of Naval Operations you would have been hard-pressed to have properly taken care of even a moderate struggle in the Formosan Straits.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. Is that right?

Admiral BURKE. Yes, sir.

That is the reason why every time one of these incidents happens we start sailing ships so that we are ready as fast as we possibly can, and we do get stretched pretty taut.

NAVAL ACTION IN FORMOSA STRAITS

Senator HUMPHREY. One of our military authorities has suggested that an evaluation of the Quemoy-Matsu incident showed that the United States got its reinforcements to the scene of the crisis very rapidly, and that this was recognized by the Chinese and helped to keep the incident limited.

Do you feel that the movement was rapid?

Admiral BURKE. Yes, sir. We had some ships, of course, right near there at the time, but within 24 hours we had the whole strait patroled and everything. They knew it. Not only were we there, but they knew we were there.

Senator HUMPHREY. Do you think the swiftness and the certainty of our movements had something to do with keeping the situation reasonably limited and under control?

Admiral BURKE. Yes, sir. I think that was a probe, and I think as soon as they ran into trouble they pulled back, and I think there will be other probes in the future in other areas.

SOVIET PROBING ACTIONS

Senator HUMPHREY. I think the most likely situation with which we are faced is limited war. I think the probability of a major nuclear war, as has been stated here by Senator Long and yourself, by premeditation or even by accident is rather remote, not that we shouldn't be prepared for it. I do not want my remarks to be misinterpreted. But I think for a long, long time we are due for these probing actions, particularly in the Asian, African, Middle Eastern, and Far Eastern areas.

Admiral BURKE. Not only military. I think one of the most dangerous things is what happened yesterday—the possibility of additional Middle East pacts with the U.S.S.R.

Senator HUMPHREY. I sat in the Kremlin across a table just about this distance from a man whose name was Khrushchev, and he told me how they regarded governments. He said, "We are not opposed to one particular form of government as against another. We deal with republics. We have no trouble with some of them; but with some other republics we do have difficulty;" and, of course, he added, "It is because of that republic's attitude toward the Soviet Union."

He said, "We deal with kingdoms. We deal with the Kingdom of Afghanistan and the Kingdom of Iran."

He said, "Now, our relationships with Afghanistan are very cordial, very good. In our relationships with the Kingdom of Iran there is much that is lacking, much that is not good. It is very serious."

Since I heard that twice that evening, I thought I would pick this thread up again with Mr. Mikoyan when he was here. I saw him, and after discussing Pasternak and religion and a few other subjects that I wanted to discuss with him, I brought up Iran and Afghanistan. I was told the same thing about Iran. The Soviets have been waging a real tough battle on Iran. I do not know whether this has gone unnoticed or not, but at the same time that they have been waging a cold war on Iran, and blowing a little hot on them, too, they have been waging the same kind of a struggle with Finland. In Finland they brought a government down to its knees.

The government was broken. Later on we were ready to come to the rescue but the damage had already taken place. That is exactly what happened in the case of the Finnish Government.

Finland's pro-West, pro-democratic government was strangled to death by Soviet pressures, just to show what they could do to a neighbor. Interestingly enough, within 30 days Iran caught it. And Iran is on the other border.

I told the State Department that this was the way the Soviets operate, and more trouble can be expected down there.

I hope the Navy is well taken care of, Admiral.

ARMS FURNISHED TO FOREIGN NATIONS

Senator LONG. Admiral Burke, that brings me to another point I have in mind. You know we hope all the friendly governments or governments not controlled by the Soviet Union can maintain their freedom.

However, when we have bases in these countries, there is no way of knowing for certain, when we get into trouble, that these countries are going to be willing to help us if we have to fight. In a great many instances that could be a question, couldn't it, sir?

Admiral BURKE. That is true, sir.

On the other hand, it is like loaning a man money. You are never sure of how he is going to use it, no matter what it is. It may help him a great deal, but it might also make him very friendly toward you. It usually does.

This arms support of foreign nations, can be extremely useful not only to improve their military characteristics, military capabilities, but also, more importantly, perhaps, to get them trained by America so

that they understand the United States and have a deep, if not affection, at least a deep respect for our people, and so that they line up with us because they respect us, and they know that in the long run we are going to win, and that is more important than the actual military equipment that they get sometimes.

Senator HUMPHREY. The military contacts, I think, are important in terms of the leadership of the countries.

In these new countries many of their leaders are in the military. Many of the young men who are coming up politically are in the military, and it is important that they have knowledge of American attitudes, American policies, Americans in general, and the American military.

But I have always been suspicious about how much this really amounted to in terms of military strength.

I think if you look upon it politically, diplomatically, economically, and socially, that these contacts are very valuable. However, we put a great deal of equipment into Iraq. I think that it is fair to say that the equipment that was given to Europe has been helpful.

However, in some localities it is a calculated risk.

Admiral BURKE. It is like Cuba, we gave some military equipment to Cuba, and we have some military missions down there now.

The naval mission in Cuba had the respect of both the Batista people and the rebels. I do not know how exactly they were able to do that trick, but they did. They gained the respect of both of them, and both of them trusted them. Because our people were very careful to play the game strictly on the top of the table, and according to the rules and also to be perfectly fair about it, the Cuban Navy wasn't in the fighting, so that they were in a better climate.

[Deleted.]

CONTACTS OF AMERICANS OVERSEAS

Senator LONG. Actually there is a great opportunity for our people who go overseas to make a great number of friends for this country.

You have several programs to help servicemen learn how to help cultivate friends for the United States?

Admiral BURKE. Not only them but their wives, sir.

I send a letter, it is a form letter, to each wife who goes overseas as to what she should do and not do; I tell her about pride in her country, she represents her country, and the way her children behave and all those things, and it has some effect.

There are pamphlets that we prepare, the State Department does, and the services do. We give these to the people.

It depends on the job that a man goes to as to the instructions he gets.

If he goes to a MAAG he gets considerable instruction. We try to teach people the languages of the country to which they are going.

If he goes to an attaché's job he gets a lot of instruction.

If he goes there in a normal ship, he gets normal instructions. There are packets in the ship, and the boys do a pretty good job.

Just before I came over here I had a letter from a Spanish woman married to an American civilian, I do not know who she is, but she was telling me about what a wonderful group of people our officers and men usually are, but she was complaining about one man.

Well, I am going to investigate that.

Senator LONG. Senator McGee told me about a trip through the Soviet Union with a group of other professors. The group was fortunate in having a former White Russian with them who was able to speak the language fluently, a very old lady about 75 years old. The Senator thought their group did a lot of good toward dispelling many wrong impressions the Soviet people have about our people and helping to spread the truth about our people behind the Iron Curtain.

He said that they thought they helped relations between this country and the Soviet Union, but there was one young woman in the group who was really a drawback because every time somebody would show her something that the Russians were proud of, she would say, "But we have something better than that."

If they put them in a good hotel room, she would say, "If you think this is a good hotel room, you ought to see the Waldorf-Astoria in New York City."

That woman could have acted in a completely different way. A man who had a home worth about $300,000 came to visit my humble home worth $3,000 when my wife and I were first married. He went out in the back and admired my wife's azaleas and camellias. He did not mention that he had a hundred times that many in his yard, and she was very pleased and honored that he admired her flowers.

There are a lot of little things that can help relations if they are handled in the right way. I think some folks hurt our relations with other countries without ever knowing that they are doing something that is just not good manners, with Americans or anybody else.

NAVY PROGRAM FOR FOREIGN OFFICERS

Admiral BURKE. That is true, sir.

One of our most successful programs is our Naval War College course for senior officers from all free nations. There are only about 30 people in Newport. They come here for a year.

We try to choose their best naval officers of the junior captain or commander rank, and they have all been very excellent naval officers.

We only take one from a nation. They mix with one another. They learn about the United States.

We have good instructors for them, and they learn the United States very, very thoroughly.

We have one U.S. officer who is with each one of those families. We try to have them bring their families over so that the families learn, too.

Senator HUMPHREY. That is very good.

Admiral BURKE. Then when they go back they are convinced that the United States has integrity and honesty and all the qualities, and instead of getting a superficial view from our movies, they know what our people are really like. We have only had that school for 2 years, and it has already had considerable effect.

USE OF COMMISSARIES

Senator LONG. I think if I could recommend it to the services overseas, I would urge them not to have so many commissaries, but to try to make the service people learn how to buy commodities from local

merchants. This would give them a chance to make more friends with those people.

If I could make a recommendation to a base commander, I would urge him to look around and see who in that locality could help him with some of his problems. I would suggest that he give that fellow a PX card and let him shop in the PX.

Admiral BURKE. The captain of the Rota base has a Spanish advisory group and they advise him on things that he would never even think of himself.

Senator HUMPHREY. You had the Spanish Navy commander over here, too, did you not? The chief of the navy?

Admiral BURKE. Yes, sir.

Senator HUMPHREY. He made a very good impression.

Admiral BURKE. We have one chief of a foreign navy over here once a month on the average, although both the Germans and the Japanese have been here this month.

NECESSITY OF STEPS TOWARD DISARMAMENT

Senator LONG. Admiral Burke, it seems to me that you ought to start somewhere to get some kind of agreement to do something about disarmament even if it was not a very important agreement, because some day, somewhere, it seems to me, we need to begin to make a little bit of headway.

Senator Humphrey mentioned the matter of a manpower cut. As long as we agreed to a manpower cut, let us say a 3 percent or a 5 percent cut, without agreeing on dollars, as a practical matter couldn't you achieve everything by just a little bit of maneuvering, for example, calling a few Reserves to active duty or a few things like that?

Admiral BURKE. It is just like the Chinese miner, sir, in feeding his horse. He fed him soybeans, and then started putting a little bit of mud in the soybeans, and the horse did not know it. It didn't make any difference, but when he goes too far, the horse dies, and that is what happens on this, and we have had a pretty good squeeze on us already, on cutting down for manpower and things like that.

Of course, you can do it for 2 or 3 or 4 percent. In the budget for the first couple of years, they took a 2 percent off for better management.

Well, better management runs out after a while, and that is what might happen here.

You can take 5 percent off of any service, if you do not put other restrictions on the service, and if you loosened the restrictions and give them a little more freedom of action, you could do it all right.

But there are so many restrictions now that with one more restriction, one more cut, it is hard to operate.

Senator LONG. Frankly, the way you people are getting cut out by the Bureau of the Budget alarms me because it makes no sense whatever. You are told that you get so many dollars and so many men. That concerns me because it looks to me as though it forces you to make decisions that you just might not like to make.

It seems to me that if they were going to cut you it would be better to say, "You get so many dollars". This would leave you more flexibility to decide what you can do with those dollars.

Admiral BURKE. That is true, sir, and we used to do that, you know.

We used to have no limitations on the number of people we had in the service at all.

When I was a young officer you got certain new obligational authority, and there were no restrictions other than the new obligational authority except your duty to Congress to spend the money for the purposes of the program for which it was appropriated. There have been a lot of restrictions through the years since then.

POSSIBILITY OF DISARMAMENT AGREEMENT

Senator LONG. Well, if I understand your view on the disarmament problem, you feel that you do not know of any agreement with the Soviet bloc right now in the way of disarmament that you would care to recommend.

You feel that you cannot trust the Soviets and that you would rather be free to go ahead and run your shop about the way you think it would get you the most effective defense posture?

Admiral BURKE. Yes, sir; and again I think at the same time we have got to continue to try. We have got to continue to talk. We have got to continue to investigate, to examine the whole problem because, as you point out, someday we are going to have to reach a system of living with the Russians without an increasing armaments race which this might turn into, and so we have got to try. But we have to be awfully careful.

Senator HUMPHREY. I want to say to you, Admiral, that it is gratifying that you have set up in the Navy a task force, so to speak, that works on surprise attack problems and knowledge of the Soviets. I hope that is being done all through the Department of Defense, and I imagine it is.

Mr. Foster feels very strongly about the need for such a group.

INFORMATION ON SOVIET UNION

I have felt for some time that the Government needed to establish a Soviet evaluation center, which would receive every bit of information we get about the Soviet Union; CIA has some limitations. If the information from the educators, from the students, from the people who go to visit their families, from the average tourist, were pooled, and digested by people who have some capability in this area, in this way we could build a kind of current library of information on the whole Soviet structure.

I personally feel that if we could spend a billion dollars to know everything there is to know about the top 500 members of the Communist Party in the Soviet Union, it would be money well spent.

If we could put productively to work a character analysis, political analysis, and background analysis, on the people who are meeting today in the Soviet Union in the central committee, we would have some very good guidelines of what is going to happen in the Soviet Union in the next 10 years, because the man who succeeds Khrushchev is in the meeting today.

Admiral BURKE. Yes, sir.

Senator HUMPHREY. And the man to succeed the man who will succeed Khrushchev is in the meeting today. I hesitate to say this, but it is surprising to know how little we know about these people.

Admiral BURKE. That is our weakness.

Senator HUMPHREY. I have a friend up in Bennington, Vt., who, for the last 10 years, has been writing me a letter once a week on the Soviets. He is an expert on them.

He spends his whole life at it.

He was an Austrian Social Democratic leader, and he came in from Austria to this country in 1941. He has been here in the United States since that time.

He has dedicated his whole life to the study of the Soviets. He has a shortwave radio; he gets every conceivable publication; he reads Russian; he studies Soviet photography, and I can honestly say that this man predicted when Malenkov's rise to power occurred. He predicted that Beria would be liquidated and he predicted the diminution of Bulganin's authority.

He does it by watching photographs as to who appears and where.

Before I went to the Soviet Union he told me of one man who was on his way out, and within a month the fellow was gone. He told me how this fellow, who was an old Stalinist, used to be up in the front lines when the pictures were taken. Then he went back to the second line, and then the third line, and in the last picture he was not there. He just faded out of the light.

Where a Soviet leader sits in the Bolshoi Theater, in the stands at the soccer game, in Red Square, all of this has a lot to do with who he is and what he is going to be and how long he is going to live.

Admiral BURKE. That is right.

EFFECT OF NAVAL REDUCTIONS ON INDUSTRIES

Senator HUMPHREY. This is just one of the many little factors, it seems to me, that we need to know.

Has the Navy made any study of the effects of cutbacks in naval facilities on local communities and specific industries or companies with which the Navy has contracts placed or did have such contracts?

Admiral BURKE. Yes, sir. We had such things as Regulus II. When we cut that out, and the F–8U3, both from the same company, it was very serious, we knew that, and it is a very serious proposition.

As we reduced the size of our fleets, we have to reduce the Shore Establishment, and what we do there is to try to balance the Shore Establishment as best we can with our operating forces, and it always hurts.

It hurts us where lots of these facilities are very useful facilities. We just cannot operate them at the low rate which we would have to operate them to keep them going. It would cost too much.

Senator HUMPHREY. One of the problems we will have in the future will be to make a budgetary cutback because of governmental policies or because of defense policy changes. It is another matter to discuss disarmament.

Let us assume that there is a substantial agreement in disarmament. What plans, if any, has our country made to take up the slack in the economic activity?

Admiral BURKE. The plans we have now are never good enough, sir. If we have to reduce so much we try to say what is the next ammunition depot that we would cut.

Well, when the time actually comes there are so many other circumstances, some of them are not foreseen, some of them have greater emphasis, and it is very difficult to follow that plan.

Besides, there are new things developed. Each time we have to reduce the Shore Establishment, we have a board meeting to get a rough cut at it, and then to examine all the factors and one of those is the effect that it will have on the local community.

Senator LONG. If you are considering the effect on a local community—and I agree with Senator Humphrey that it should be considered—in many developed prosperous areas, rather than closing facilities, couldn't the property be turned over to the local people for development purposes? Perhaps they could find some industry to go in and develop it, or build homes.

Admiral BURKE. Sometimes that is done, sir, at Chincoteague, for example, NSA planned to move into Chincoteague, and they will be able to take up some of the slack. They helped the community on that.

CLOSING REMARKS

Senator HUMPHREY. Admiral, we want to thank you very, very much. You have been generous and helpful, and we appreciate your customary courtesy, and your willingness to take time to come up here.

Admiral BURKE. Thank you.

Senator LONG. Personally I have more confidence because you have demonstrated such confidence in your shop.

Senator HUMPHREY. We always have confidence in you, Admiral.

(Whereupon, at 5:15 p.m., the subcommittee adjourned, subject to the call of the Chair.)

DISARMAMENT AND FOREIGN POLICY

MONDAY, FEBRUARY 2, 1959

U.S. SENATE,
SUBCOMMITTEE ON DISARMAMENT OF THE
COMMITTEE ON FOREIGN RELATIONS,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:05 a.m., in room F–53, U.S. Capitol Building, Senator Hubert H. Humphrey (chairman of the subcommittee) presiding.

Present: Senators Humphrey, Long, Wiley, Hickenlooper, and Langer of the subcommittee, and Senators Morse, Lausche, Aiken, and Carlson.

Senator HUMPHREY. This morning we are continuing our study of the relation of arms control measures to national defense strategies and capabilities with the testimony of Gen. Maxwell Taylor, Chief of Staff of the Army, and Gen. Thomas White, Chief of Staff of the Air Force. Last Friday we heard Adm. Arleigh Burke, Chief of Naval Operations.

The testimony of all three of these Chiefs of our major military branches we hope will give us a comprehensive picture of the views of the National Military Establishment on the relation of disarmament to national defense. Among the subjects which we plan to go into this morning are the effects of nuclear arms controls upon weapons development, the problem of arms limitation and regulation in Europe, the impact of arms control upon defense strategies, and the participation of the Defense Department in preparation of disarmament proposals.

Generals Taylor and White, we will proceed with your prepared statements. After that you may answer questions, if that is agreeable with you. If any one of my colleagues wishes to interrupt, he may do so.

I believe, General Taylor, you will proceed first.

STATEMENT OF GEN. MAXWELL D. TAYLOR, CHIEF OF STAFF, U.S. ARMY

General TAYLOR. Mr. Chairman and gentlemen, I appreciate this opportunity to appear before you in regard to the relationship of arms control to overall foreign and defense policies. I would like first to make a brief statement outlining the major considerations in this relationship as I see them. Then, I would be happy to answer questions you may have, and to develop the matter further in such detail as you may desire.

MAJOR CONSIDERATIONS

In general, I shall confine my statement to the military and politico-military aspects of the problem, but let me assure you that I am cognizant of the wider scope of the matter of arms control. Arms control is a matter of national security in the broadest sense, and, as such, is susceptible to final resolution only at the highest levels of the Government. Any decisions with respect to arms control should be made only after careful consideration of the international situation, of our national security, and the impact upon our national strategy. However, our military strategy and the force structure to implement such strategy will inevitably be influenced by any steps toward arms control. Therefore, I would say that it is essential that there be a clear understanding of the probable effects upon our defense efforts and programs.

CATEGORIES OF PROPOSALS FOR THE CONTROL OF NUCLEAR WEAPONS

The precise effects of any measures for the control of armaments are dependent to a major degree upon the specific provisions of each proposal for control. At present, there are many such proposals, the most significant of which address themselves primarily to the control of nuclear weapons. Proposals for the control of nuclear weapons fall into three general categories: (1) banning or suspension of nuclear weapons testing; (2) banning of the production of nuclear materials for use in weapons; and (3) prohibition of the use of nuclear weapons in war.

Considering each of these categories briefly in turn, I will also touch on the matter of conventional nonatomic arms, since these will also be affected by any measures directed at the control of nuclear weapons.

BENEFITS DERIVED FROM NUCLEAR WEAPONS TESTS

The testing of nuclear devices and weapons allows us to refine and improve the weapons in our nuclear inventory on an orderly, continuing basis, and to determine the feasibility and efficacy of new devices, theories, and concepts. Tests of new devices or designs eventually permit the introduction of both proved and improved weapons into the stockpile. As a result of these tests, it is frequently possible to effect savings both in funds and in fissionable material. From them, moreover, we can increase our knowledge of weapons effects and thus develop better tactics, techniques, and equipment for the modern battlefield. We must have this knowledge if we are to use atomic weapons effectively with minimum risk to our own forces and to friendly populations.

Specifically, testing enables us to learn how to use costly and relatively scarce fissionable material more effectively. As our efficiency increases, we are able to reduce the weight and size of nuclear warheads and thus simplify the problem of their delivery. Even more significant at this point in time is the contribution testing makes toward increasing the versatility of our nuclear stockpile. Recently, we have made [deleted] progress toward the development of small tactical nuclear weapons [deleted], with minimal fallout effects, which will make unprecedented firepower available to small unit commanders. These weapons [deleted] will provide us with a significantly better

capability for conducting military operations. For the first time, we will be able to bring atomic fires close to our own forces in the manner of conventional close support artillery. While useful in both general and limited war, they are particularly adapted to the latter where we will always be most anxious to avoid unwarranted damage in the friendly lands to which we bring our military aid. [Deleted.]

Nonetheless, there is yet a great deal to be learned about the design, the effects, and the use of tactical nuclear weapons. In point of fact, such laboratory tests as have been made indicate that we have only scratched the surface in the field of tactical nuclear weapons. Similarly, testing is essential to further improvements of nuclear warheads for air defense missiles and to the production of a warhead for the antimissile missile, Nike-Zeus. As the latter is a weapon under development to defend against the incoming ballistic missile, it is of the utmost national importance to expedite all elements of the anti-ICBM system.

EFFECT ON WEAPONS DEVELOPMENT OF SUSPENSION OR BANNING OF NUCLEAR TESTS

Suspension or banning of nuclear tests will not necessarily bring our weapons development programs to an abrupt halt. Experts can extrapolate from known data and thus can design new and theoretically improved weapons without further test information. However, development is slower and less certain if theory cannot be validated by actual tests. Furthermore, even the best theoretical procedures *do not produce proved weapons, particularly as regards safety features.* And, I should add that extrapolation cannot be carried forward indefinitely without some recurrent input of new factual and experimental data.

On balance, then, it is certain that our program for the development of nuclear weapons will suffer from the banning of tests.

EFFECT OF A BAN ON PRODUCTION OF NUCLEAR MATERIALS

I have pointed out the immediate effect of a test ban or suspension in respect to tactical nuclear weapons. If we are unable to exploit fully the capabilities of these weapons in future military operations, then as a matter of urgency we must increase our so-called conventional or nonatomic firepower capabilities. Actually, improvement of our conventional capability is a matter of importance under any conditions.

Senator HUMPHREY. Is a matter of what, sir?

General TAYLOR. Is a matter of importance under any conditions, that is, conventional or nonatomic.

Senator HUMPHREY. Yes, sir.

General TAYLOR. However, any slowdown in the development and production of tactical nuclear weapons will magnify the requirement. Fortunately, there are promising approaches to the improvement of conventional arms which should be pressed, with a view to their increased production and procurement.

A banning of the production of nuclear material for weapons purposes would preclude any increase in the current stockpile now available for military use.

Senator HUMPHREY. May I just say at this point, General, that this item on the banning of production has not been discussed yet at any conferences which have been held? It relates to a question that we posed to you.

General TAYLOR. Yes.

Senator HUMPHREY. But the first item to which you have addressed yourself, namely, the suspension of tests, relates to present diplomatic negotiations.

General TAYLOR. Yes.

Senator HUMPHREY. This item on banning the production of nuclear material relates to a proposal which our Government made a year or so ago, but it still is somewhat in the stages of what we might call theoretical discussion.

General TAYLOR. My comment does not specifically relate back to that Government proposal, but rather to the overall question of production.

Senator HUMPHREY. Yes.

General TAYLOR. Not only would it be impossible to increase the size of our weapons stockpile, but its composition would be frozen except for such modification of existing weapons as might be possible through a costly and time-consuming remanufacturing process.

MODERNIZING WEAPONS STOCKPILE

I should like to comment on this difficulty to modernize the stockpile and to vary its composition to meet changing strategic needs.

At present, as improved methods and techniques allow us to increase the efficiency of our weapons, new and better weapons replace older ones in the stockpile. To cut off the source of fissionable materials would stop this program. [Deleted.] As you know, production of tactical nuclear weapons and provision of warheads for new weapons systems, such as the antimissile missile, will require additional fissionable material.

I am just pointing out the expensive character of the so-called reworking process.

Reworking and redistributing the fissionable material now incorporated in stockpiled weapons might appear to be a measure to alleviate the need for new material. In my opinion, however, it would provide only a partial solution and would require the acceptance of some risk. Reworking fissionable material is a time-consuming process. [Deleted.]

As a result of the probable effect of such a ban upon the development of tactical weapons, the development and procurement of more effective conventional nonatomic weapons systems again assume an increased importance.

EFFECT OF A BAN ON USE OF NUCLEAR WEAPONS

A ban on the use of nuclear weapons would not of itself signify a worldwide rejection of force as an instrument of policy in international relationships. Forces equipped with nonatomic arms would still provide an aggressor nation a capability for imposing its will upon others—upon those possessing fewer conventional resources. Additionally, there is always the possibility that other parties to the ban might cheat.

Even a completely foolproof system of control and inspection of nuclear weapons would result only in a reversion to former standards of measurement of military strength. By this statement, I mean that the relative military strengths of the free world and the Communist bloc would again be measured largely in terms of manpower and industrial mobilization potential, divisions, ships, and aircraft. A complete and rapid reappraisal of our national strategy and force structure would be mandatory and we would be obliged to reshape our forces immediately. [Deleted.]

SUMMARY OF THE MILITARY EFFECT OF ARMS CONTROL

To summarize, the military effect of arms control, as I have discussed it, would be as follows:

Test bans or suspensions would slow down and ultimately halt the development of essential empirical knowledge needed to develop improved nuclear weapons and methods of atomic warfare. This condition would necessitate extensive compensating efforts to develop other means of firepower if our military forces are to be fully combat effective.

A ban on weapons production would operate to freeze our weapons stockpile, both quantitatively and qualitatively.

A ban on the use of atomic weapons would not rule out the use of other means of military force by aggressor nations to accomplish their purposes, and would expose us to the danger of a surprise violation by an enemy.

QUESTION OF RELIABILITY OF AGREEMENTS WITH THE U.S.S.R.

In closing, I should like to emphasize several points:

First, the reliability of agreements with the U.S.S.R. may be, at best, questionable in the light of recent history. Whether the current Soviet leadership may now be relied upon to live up to the letter, let alone the spirit of any arms control agreement, is beyond the purview of military judgment. In any case, it is my opinion that acceptable arms control can be attained only if there are in effect detailed inspection and control procedures to which both sides of the power combination freely and fully subscribe. I might add that in my opinion it is most important that the testing of small weapons and underground tests not be included in any arms control agreement at this time.

PSYCHOLOGICAL ASPECTS OF ARMS CONTROL

Second, arms control poses major psychological aspects which must be given serious consideration. Many people, particularly of the less-developed and uncommitted nations, will tend to equate any step toward the control of nuclear weapons to a complete renouncement of the use of force, and as an implied agreement against the use of nuclear weapons under any circumstances. In all probability, the Soviets would exploit this attitude to their advantage and seek to create increasing inhibitions on the use of atomic weapons in any situation. While opposing this trend, we must develop a military strategy flexible enough to respond effectively to any political decision affecting the choice of weapons.

EFFECT OF ARMS CONTROL ON CONVENTIONAL FORCES OF UNITED STATES AND U.S.S.R.

Finally, I would like to point out the Soviets and their allies have large modernized ground forces, as well as supporting air forces and a large submarine force. The relative effectiveness of these forces will increase with controls placed upon nuclear weapons. Therefore, the United States would be obliged, as a matter of extreme urgency, to compensate for any reduction in its nuclear capability by a corresponding increase in its nonatomic conventional capability in all military components—land, sea, and air.

NUCLEAR WEAPONS BAN WILL NOT REDUCE DANGERS

Thus, a ban on nuclear weapons will not, in itself, reduce tensions or eliminate the danger of war or surprise attack. These dangers will remain in the old forms which have plagued mankind throughout history and no doubt new, nonatomic weapons can be developed in time which will approach in effectiveness the atomic weapons put aside. Hence, the problem of peace remains unchanged—how to deter international evildoers through visible, flexible military force until reason and neighborly understanding play a larger part in determining the conduct of nations.

Senator HUMPHREY. Thank you very much, General Taylor. I believe the procedure that might be effective here this morning, gentlemen, would be to let General White, the Chief of Staff of the Air Force, proceed with his statement, and we then would ask both of you to submit to questioning. In this way we would get the full positive statements of the two service Chiefs. Is that agreeable with my colleagues?

You can go right ahead, sir.

STATEMENT OF GEN. THOMAS D. WHITE, CHIEF OF STAFF, U.S. AIR FORCE

General WHITE. Mr. Chairman, and members of the committee, I welcome this opportunity to appear before your committee to discuss the important subject of arms control and disarmament.

NEED FOR CAUTION IN CONSUMMATING ARMS CONTROL AGREEMENTS

Effective and equitable solution to arms control problems in today's era of high performance weapons systems—which have compressed time, distance, and destruction into such a violent package—would be a boon to mankind surpassing anything in history. However, the the very fact that these factors have been so compressed imposes a greater demand for caution and deliberation in the consummation of arms control agreements than ever before. Finalized measures must be capable of positive and precise control and enforcement. Should anything less occur, this Nation's security and that of the free world would be unacceptably compromised.

The philosopher, Spinoza, once pointed out:

Peace is not absence of war, it is a virtue, a state of mind, a disposition for benevolence, confidence, justice.

As members of this committee, you gentlemen are most familiar with the trials and tribulations that men through the ages have faced in their efforts to attain lasting peace. Various methods have been employed in this endeavor. We have learned through experience that the "state of mind" to which Spinoza referred must be mutual and that mere expressions of intent and good will are insufficient. Positive tangible actions in the same direction must also be taken.

In recent years, concentrated effort has been exerted toward achieving the goal we all seek. I refer, of course, to measures taken to control arms after World War I and II and the Korean war. All of us here today know that these most recent efforts have met with little success.

After World War I and for a limited time after World War II this country could and did disarm. We led by example. We demonstrated our lack of aggressive intentions visibly to the entire world. We did this, secure in the knowledge that distance would protect us sufficiently to rearm in time if we were violated.

OUR STRATEGY OF DETERRENCE

We know that this is not feasible today. This knowledge is the factor that makes caution mandatory. It is the reason that, over the last decade, this country has adopted a strategy of deterrence through possession of military power—or to put it differently, a policy of peace through strength.

During these past 10 years, our strategy of deterrence has been primarily reflected in the possession of nuclear weapons and strong airpower. It so exists today. I feel that this strategy must continue.

Airpower today, and aerospace power tomorrow, comprise the capability that has compressed time, distance, and destruction into the compact violent package I referred to earlier. Likewise, it is that very same aerospace power which constitutes the primary military threat against us. As long as there is such a threat, we must maintain a counterforce to serve as a deterrent. As the threat against us increases, and as the possibility of warning of surprise attack decreases, we must concomitantly improve our own counterforce and our capacity to react quickly and decisively. As a military man—and from the standpoint of national survival—I see no other recourse under present conditions.

The military force structure of the United States is premised on one basic objective—defense, not aggression. I agree that it is a paradox that our "defense" is primarily based on a strong airpower offensive, but we cannot take a chance on risking our survival solely on a defense system which might someday be found wanting in the face of an overwhelming offense. Consequently, the only plausible course of action is to possess forces which deter an enemy through his fear of the consequences to him should he attack.

I am convinced that peace today is due in great part to the military strength which the United States has in hand. Peace tomorrow will likewise depend upon such strength unless the threat to our security and that of the free nations is withdrawn. Our only guarantee to continue freedom is to assure that we make no move to reduce our strength without a comparable reduction in that threat.

Mr. Chairman, that concludes my statement. I will be pleased to try, with General Taylor, to answer any questions to the best of my ability.

SUBCOMMITTEE PROCEDURE

Senator HUMPHREY. Gentlemen, I am very grateful to you for your statements and the cooperation you have extended to us.

I am going to ask my colleagues now to ask whatever questions they may have in mind.

The first question will come from Senator Long who, as a member of the subcommittee, will be followed by Senator Wiley, and we will go down the table.

Senator LONG. Mr. Chairman, I would be perfectly content to have a time limit put on each Senator's questioning. A number of questions occurred to me on the basis of the statements here. These witnesses have important responsibilities and I do not want to cut off a number of Senators from asking questions. What is the ruling of the Chair?

Senator HUMPHREY. Well, we have until 12 o'clock, and suppose we put a 15-minute limit on each of us.

Senator LONG. You know that it is something unusual to put a time limit on a southern Senator.

ADVANTAGE IN KEEPING A STOCKPILE OF ATOMIC WEAPONS

First, this thought occurs to me: If you are going to prevent the use, let's say, of any type of weapon, whether it be atomic weapons or tactical A-bombs, it seems to me that the only safe way to go about it is how we went about outlawing poison gas, that is, by not using it. But if you have a fellow like Hitler against you, you would want to have plenty on hand because he might not keep it.

There is the story about Neville Chamberlain's agreement with Hitler, that gentlemen's agreement. The only trouble was that Hitler was no gentleman.

Do you believe that if we make an agreement about outlawing atomic weapons, we ought to have plenty of them available to us?

General TAYLOR. I think that the most effective kind of agreement is one which is mutually self-serving. I think that factor probably explains the failure to use gas in World War II, after both sides looked at the possibilities. Certainly, we didn't intend to use it, but we could have used it.

Senator LONG. Just as an example, wouldn't it be very stupid for us, knowing Russia has large quantities perhaps of hydrogen bombs and heavy-scale atom bombs, to agree that we would destroy our stockpile, when we would have no ability, even if we had an inspection system, to find their stockpile? What chance would your man wandering around Russia have to find a stockpile hidden in a mountain?

General TAYLOR. In the first place, I wouldn't know how to go about destroying it. We could demilitarize the weapons, but fissionable material itself is difficult to destroy, so I never am quite sure what people are talking about when they say absolutely ban and destroy it. Secondly, under an inspection system, I wouldn't know what they would inspect for except to verify the continued demilitarization of stocks of fissionable material.

Senator LONG. Do you think the idea that has been suggested by the Russians of disposing of the atomic stockpile could be practically enforced so that either side could trust the other to observe the agreement?

General TAYLOR. Only by an inspection system, and then with all the possible slips that might enter into the implementation of such a system.

Senator LONG. Would you want to take the chance with the Russians that each country is going to get rid of his stockpile?

General TAYLOR. I cannot visualize a situation where I would want to do that.

Senator LONG. Mr. Mikoyan sat right in this room and said, in discussing the Berlin question, "We don't trust you and you don't trust us." Why don't we go about this in a way that we can see exactly what the other fellow is doing? The point I had in mind is that I don't think we can trust these fellows, and I don't think they would trust us. If they thought we were going to enter into some sort of agreement, they would keep a large stockpile hidden someplace where we wouldn't know anything about it.

The point I have in mind is that if you don't want the enemy to use these superweapons on you, you had better have plenty of them on hand if he does.

General TAYLOR. That is a continuation of what is referred to as mutual deterrence because of the fact that it is not profitable for either side to proceed against the other.

Senator LONG. Do you agree with that?

General TAYLOR. Yes, sir.

Senator LONG. That is the only way I could approach it.

General TAYLOR Excuse me; I agree with this approach under present conditions. Now if the world changes just as the leopard changes its spots, and a lot of things like that occur, a different solution may be required.

Senator LONG. Then the second thought which occurs to me is this: If we enter into an agreement that, if we have to fight a war, we won't use hydrogen bombs, for example, or that we will only use bombs up to a certain size, or even if we would agree we would only use conventional weapons, then as long as this country was doing all right, as long as we were ahead of the game, we wouldn't consider breaking that agreement, would we?

General TAYLOR. No.

Senator LONG. I think any nation at the time they find themselves losing might give a second thought to whether they are really willing to go down to defeat and lose their freedom or break that agreement.

Take any given weapon, and if your enemy is not going to use it, and if he actually keeps his agreement, it can be to his advantage if he has put a lot of his productive effort and money into something he will use. It could be that way for us.

Suppose we had to fight a war with conventional weapons. Then the money spent on atomic weapons would be wasted.

General TAYLOR. If they canceled out the other fellow's atomic weapons they would then have served their purpose.

Senator LONG. What I mean is this: If we construct any class of weapons which we never use, but the enemy saves his money and puts it into the kind of weapons that it is agreed you will have to fight with,

then the fellow who concentrates on the weapons he will use will have the advantage. Isn't that correct?

General TAYLOR. That is correct.

Senator LONG. So it seems to me that the only way to approach a disarmament agreement is that we would have these weapons, and, as a matter of fact, both sides would have them, but the agreement should be not to use them.

I just was wondering how that strikes you.

General TAYLOR. The agreement, to be self-policing, must be predicated on the obvious interest of both sides to continue to abstain.

Senator LONG. Isn't that about the only kind of disarmament agreement we could afford to enter into, so far as the Soviets are concerned?

General TAYLOR. I would think so. I don't like to appear to be completely negative in discussing this since the purpose is one with which we sympathize insofar as the end product of disarmament is concerned. I would think that any disarmament action that would be definitely controlled, and for which we insist that the policing system be in effect before it is adopted, should be in principle acceptable.

NEGOTIATING FROM STRENGTH

Senator LONG. There is another thing which occurs to me, General Taylor. You are right, I think, when you indicate that we should be flexible and that we should be willing to consider anything that comes up, or any new proposal that anyone advances. But, in general, speaking of our disarmament conferences, should we not think of disarmament in terms of disarming from a position of superiority? Usually when you disarm, you think in terms of how many weapons you have and how many weapons the other fellow has. If you are on a parity, then each party reduces what he has by maybe one-third, or by 20 percent, or maybe by 50 percent, depending upon what the agreement is.

Isn't that the best way to approach disarmament conferences?

General TAYLOR. I believe Winston Churchill has said something to the effect that one should arm to parley.

Senator LONG. In other words, the better armed that we are, the better we are in position to negotiate, especially if we say, "Well, now, we have every intention of keeping ourselves well-armed in this defense posture, particularly as our defense is compared to yours, unless you are ready to agree that we will both reduce our arms together."

General TAYLOR. I think in all disarmament questions we should negotiate from strength.

I wish my colleague here would contribute something on this point.

Senator LONG. I will be glad to question him in a moment or two.

STRENGTH OF CONVENTIONAL FORCES

I saw a debate this morning between Senator Symington and Senator Saltonstall on television on the "Today" program. Frankly, I was terrified, because the effect of that debate was—and I didn't see Senator Saltonstall deny any of this—that in terms of intercontinental ballistic missiles the Russians are ahead of us, and that we

are presently surrendering a 4-to-1 advantage to them if you project that situation into 1961. I believe about the best that could be put in response to that is that it might be just a 3-to-1 advantage. Senator Saltonstall said that we are relying upon atomic submarines. Yet, according to testimony, we have heard, we are relying on them—that is, on submarine-fired missiles—but we don't have them. For all we know, the Russians have them now. Then we are told that we are building them and that we will have them 2 or 3 years from now, but at that time we expect the Russians to have a lot more than we will have.

It occurs to me that if the Russians started a war, maybe we might have some chance of beating them with conventional weapons. Suppose it gets down to the fact that we wouldn't use nuclear weapons. How is the Army shaped up to take the field against the Russians?

Senator WILEY. You are making an argument for armament, not disarmament.

Senator LONG. Either way.

General TAYLOR. As I say in my prepared statement, first in regard to your concern over missiles, General White will speak better, let's not talk only about ICBM's, and say we don't have enough. What must be considered is a combination of delivery means.

The fine bomber force, how do we stand? I am not discouraged with the picture. As we look down the road, it may be different.

Senator LONG. As far as the bomber force was concerned, we heard testimony that the planes are becoming obsolete and that we are falling behind in that.

But as far as your part of the services is concerned, sir, the Army part, and you are scheduling another cutback this year, what is our strength, based on what we previously had, compared to Russian strength?

General TAYLOR. I think your question referred to our ability to fight a conventional war. We are very much aware in our equipping of the Army of the necessity to keep what I call the "either/or" capability; in other words, to fight with or without atomic weapons.

As I point out, however, in my prepared statement, if we were sure we could not use atomic weapons, we would certainly have to exert much more effort in terms of manpower and weapons. In order to raise our conventional capability, we would have to raise our expenditures.

Senator LONG. You have testified that we should be equipped in such a way that we could fight in either way.

General TAYLOR. I think we have to be able to fight with or without atomic weapons. In many forms of limited war which may occur there is a strong likelihood of restrictions being placed on atomic weapons, if they are used at all.

I am always reminded, in these so-called limited situations, that we are usually going to help a friendly nation, and we don't want to go in and destroy a country we are going to save by use of our own weapons. There are many reasons why we ourselves, if we were told we could not count on atomic weapons at all, would have to go in very heavily for developments in our conventional arms.

ARMY DIVISION STRENGTH

Senator LONG. General Taylor, how many divisions do we have now?

General TAYLOR. We are just passing from 15 to 14.

Senator LONG. So you expect to have 14 divisions.

Out of a division, how many men can you put on the front line according to your table of organization? In other words, if you have a fighting division, how many of those men do you expect to have on the front line?

General TAYLOR. They would all probably be on the front line in the kind of war we expect to wage nowadays—every man.

Senator LONG. A truckdriver or anyone else?

General TAYLOR. They would be in the impact zone of the enemy's weapons.

Senator LONG. How many men do you figure to a division—15,000 or 18,000?

General TAYLOR. Only about 13,000 in a division; World War II had about 18,000.

Senator LONG. If you have a 13,000-man division, then, with 14 divisions how many men does that give you in your division slice?

General TAYLOR. The worldwide division slice will run about 60,000 men.

Senator LONG. Multiplying 14 by 13,000 would give the number of men.

General TAYLOR. I just remind you that the men in the divisions are not the only ones who fight. Outside of the divisions there are tank, artillery, and missile units, all composed of fighting men. The fighting men are not limited to divisions, by any manner of means.

Senator LONG. How many men would you figure you had that you could actually put in combat?

General TAYLOR. We distinguish, in analyzing our budget, for example, between the so-called operational forces and the support base in the United States. About 70 percent of the Army is in the operational forces. They include the tactical units, and all kinds of support necessary to keep these forces in action overseas. So about 70 percent of the Army, you might say, are operational forces, and are directly or indirectly concerned with the requirements of combat.

Senator LONG. I saw the analysis done by the Preparedness Committee, of which Senator Lyndon Johnson is chairman, some years ago, which indicated that when you put a division in combat you have 7,000 men on the line, and about 8,000 men backing up those 7,000. Do those ratios still remain?

General TAYLOR. It depends on what you mean by "back up." They are just as essential to combat as the men in the front line.

Senator LONG. Of course, I can't help but remember what Winston Churchill said in his book, relative to the Battle of Anzio. He was trying to find out why the Germans had achieved a superiority in infantry when we had been rushing things as fast as we could. In the third day of battle they had superiority. He asked to have laid on his desk a memorandum of how many trucks and tanks and men we had ashore, and he looked at it and saw that we had, say, 14,000 trucks—I can't recall the exact figure—on the beachhead at that time, and a driver and an assistant with each truck, and he said we

had 28,000 men in trucks on that small beachhead. And he said, "It is no wonder the enemy had achieved superiority of infantry. We must have a tremendous advantage in chauffeurs."

I was just thinking in terms of actually how many men we get on the front line——

Senator LAUSCHE. He hasn't answered the question of how many men we have in the Army. He says 70 percent in combat, 30 percent——

General TAYLOR. Operational.

Senator LAUSCHE. What is the total number?

General TAYLOR. 870,000 men, sir.

Senator LAUSCHE. And 70 percent of those are——

General TAYLOR. In operational functions, to include such troops as engineers, who are necessary to keep the combat troops moving, and quartermasters, to keep these troops fed and clothed, and so on.

Senator LONG. How many men do you estimate the Soviet Union has in its operational forces?

General TAYLOR. I have no way of breaking them down in that way. They have 175 divisions.

Senator LONG. They have 175 divisions against your 13 or 14?

General TAYLOR. Well, if you are going to use 175, you should also take into account our National Guard and our Reserve divisions, which are improving in quality all the time.

Senator HUMPHREY. I think I will have to interrupt you, Senator Long, after this question. Go ahead.

Senator LONG. If you take those divisions into account, what would be the comparable figure against his 175?

General TAYLOR. Twenty-seven Guard and 10 Reserve, a total of 37, adding 14, which would be 51 divisions, I think, would be considered.

Senator LONG. As comparable to their 175?

General TAYLOR. I should suspect that is so.

Senator HUMPHREY. In accordance with your suggestion regarding the time limit, Senator Long, I think we will now move to Senator Wiley who can proceed to ask questions of these two gentlemen.

HOW LONG WOULD A NUCLEAR WAR LAST?

Senator WILEY. I think it is conceded by all of you gentlemen that the technique of war has changed, because of the inventiveness of humanity, and so forth. That being so, in case of an all-out war how long do you think it will last?

General TAYLOR. Nobody could answer that, Senator. You have to first tell us, when is this D-day. Is this going to be a surprise attack, is there going to be no limitation on the use of atomic weapons, in which case we will expect that the United States and Soviet Russia will be pretty well leveled. Who will be able to struggle to his feet in the end and claim the victory and in what period of time, I personally cannot predict.

Senator WILEY. Well, I think one of you experts has said that it would be a matter of hours, if not days, if Russia and our country got into a war with the weapons we both have, and it became an all-out war, that one would practically destroy the capability of the other.

General TAYLOR. With surprise attack and with no defense above that which we have now, I would say that is probably true, that the decisive phase would be short but that would be the extreme case which you cite.

General WHITE. That is the Air Force thesis, Senator Wiley. The decisive phase of a nuclear war would be concluded in hours, or at the most in days.

Senator WILEY. Two hours?

General WHITE. Hours or days.

COMPOSITION OF OUR DETERRENT

Senator WILEY. Then from a psychological standpoint, the argument of deterrence is really the only argument that would be adequate to operate to keep the other fellow from starting something?

General WHITE. On the enemy's mind.

Senator WILEY. Is that right?

General WHITE. Yes, sir.

Senator WILEY. Now, then, the real question is whether our deterrent is adequate. That is what is controversial. I suppose that is what Senator Long had in mind this morning when he mentioned the television program on which the two Senators appeared. Not being experts, we don't have the right to tell people a lot of things we don't know anything about.

Now, I am coming to you, as experts, for information. I want you to give me a very quick summation of what constitutes the deterrent.

Now, the other day we received testimony in another committee that while we were what might be called deficient in certain lines, that such things as our bases in Europe, the equipment we have there, and the strength of the allies we have, went to make up the over-all picture of the deterrence. I would like to get each one of you to give me your individual judgment on the adequacy or inadequacy of the deterrent. My business, as a Senator, is to find out whether we are barking in the dog house, or whether we are really barking out where we have a right to bark.

General TAYLOR. Shall I take it on first?

Senator WILEY. Yes.

General TAYLOR. First, I would undertake to define what I mean when I refer to our deterrent forces.

Senator WILEY. Yes.

General TAYLOR. I refer first to those atomic general war deterrent forces presently represented by the bombers of the Air Force and of the Navy. I consider them as the essential offensive element in the general war deterrent forces.

I would add, however, that another important part of that deterrent force is the defensive component represented by our air defenses which prevent our country from inviting attack and puts a question mark into the enemy's calculations as to what he would need in attacking forces if he is going to succeed.

I would also mention as a part of that defensive element the warning system—the alert system—which again is a reminder to the enemy he can't surprise us if the system is as good as it should be.

Now, there are other important components of the deterrent forces. Among them I would list our Army units in Europe with the tactical

air forces there and also the forces of our allies are part of the deterrence. They deter the enemy from embarking on a surprise attack or military incursions on the ground.

So really one concludes that the general war deterrent forces, the atomic air retaliatory forces, the continental air defense forces, and our overseas deployments are the first rank of deterrence. But deterrence goes further than that. It includes the strength of the United States overall, our political and economic strength, our determination, our state of morale.

So when you talk about deterrence, sir, I would suggest it is a highly complicated business, and the military has just one, but a very important part to play.

Senator WILEY. Well, I presume that our development of submarines with ability to fire missiles, is coming into play.

General TAYLOR. Those I am talking about are what we have. We don't have any such weapons at the present time.

ADDING STRENGTH TO OUR DETERRENT

Senator WILEY. The other day I asked some witnesses whether we had any "shots in the locker," and the answer was "Yes." What I mean is, are we sitting on our hands, or are we really going ahead to invent and develop new instrumentalities which would add to the strength of our deterrent? I am not asking what these new instrumentalities are, because I think that information belongs to your branch of this Government.

General TAYLOR. We have, of course, very elaborate and very costly research and development programs in all the services, bent on getting just what you suggest. We should never stand still in this business, and the deterrent forces I mentioned to you a moment ago must be modernized and progress constantly, if we are going to maintain a deterrent.

I wish General White would take that one.

Senator WILEY. You answer, General White.

General WHITE. Take the last one, research and development. I believe the United States must keep in the forefront. We have very large sums, but this is a very expensive proposition, and there is a very fine line of judgment as to how much should be put on that particular phase of our armament program.

I personally believe that it is one that should be given very heavy emphasis, because technology is moving very fast.

COMPOSITION OF OUR DETERRENT

To go back to the original question of what is our deterrent, as General Taylor was talking I jotted down a few quick notes, and I agree with everything that he said. I think that I might elaborate a little bit from the Air Force point of view. I think that I would put warning as one of our chief points in the matter of deterrence. The enemy knows that we have a very effective and very extensive early warning system for warning against air-breathing missiles and aircraft. We do not at the present time have one against ballistic missiles. One is being put into effect just as fast as it can be constructed, in the Arctic areas.

Another element of warning which the Russians can never be sure won't be successful is the matter of our strategic intelligence. We certainly have people who spend their lives in that sort of business, and that is a factor that the Russians must give very great weight to. While we would all like to have more and better intelligence, we nevertheless, I am convinced, have a pretty good system, and that also is a factor which the Russians must bear in mind. They know we know certain things about them, and they can't be sure that even a proposed surprise attack wouldn't be uncovered just from undercover agents alone.

There are other reasons why a surprise attack is difficult. I won't say it is impossible, but logistical problems in moving large forces that would be necessary to set off a surprise attack are enormous. I feel the probabilities very greatly favor our getting some tipping of the Soviet hand. As time goes on that will be more difficult when we get into the missile field.

On the other hand, to launch missiles in a salvo, which is necessary in order to achieve complete surprise, is to our way of thinking, from what we know about the business, an absolute impossibility at the moment.

However, that time will come.

Next to warning I would put our offensive capabilities as the prime element of deterrence. In that respect General Taylor has very sagely pointed out that deterrence is, No. 1, a state of the enemy's mind. He must believe that we have capabilities to retaliate and to win, if he starts a war. "Win," of course, is subject to interpretation, because probably nobody will win in a nuclear war. But at least we must be able to prevail and come out with more to salvage than the enemy.

Today, the deployments of our Army and Navy and Air Force are worldwide. The Soviet Union is really ringed by our forces. The Soviets will perhaps have an advantage in the ICBM age, which is coming, because then the central position will be quite a good one since they can reach us from any place within their own boundaries. But at the moment, and for the future for some years to come, we have them ringed with all kinds of forces.

Of those forces, I put the Strategic Air Command in the forefront, and I am sure my military colleagues agree. That force is comprised now of bombers, medium and heavy bombers, and of some air-breathing missiles. These things are spread around. They are ready to the degree that SAC right now has a significant number of bombers on 15 minutes' alert. You could go to any SAC base in the world today and could, I think the commander would be glad to put it on for you, just push the button and you would find crews instantly in their jeeps dashing down to get into their airplanes. The force that is on alert would be ready to take off in 15 minutes.

In addition to that, there are other aircraft that are in the air, not on alert, which would not be subject to damage. There are other aircraft and crews which would become airborne after the 15 minutes just as fast as they could be generated.

There are other offensive forces in Europe and in Asia, consisting of fighter bombers, all of which are atomic equipped, also on very fast alert.

Next, and in addition to that, the Navy has aircraft carriers with a limited number of aircraft which can participate in a strategic offensive.

They also, I presume, are on alert; although the numbers are limited, they are helpful.

Then we have defensive forces abroad wherever we have bases. Our allies also have air defense forces. Here in this country and in the far North we have quite an extensive air defense network. We have a certain number of fighters on a 2-minute alert. They are exercised every day; they not only have to stand by for the war alert, but must also be scrambled to identify unknown aircraft in the United States. Radar will pick up an unidentified airplane—one we don't have a reading on. There are many cases every day where our fighters are scrambled to identify unknown aircraft and then come back and report them.

Now, the answer to that is that if the number of unknowns exceeds a certain level, then the air defense commander begins to get worried. However, he knows from experience that our system of CAA route reporting, the inevitable error of pilots not being exactly on course, unexpected winds, and so on, always result in some unidentified aircraft.

There is a threshold beyond which that number of unidentified aircraft begins to raise danger signals. If it is very high, you can be sure that the air defense commander will call a red alert, and the U.S. defenses are placed on a readiness position.

The point is that the defense also stands as a deterrent. The enemy can't be sure what his losses will be. They will be considerable.

In addition to that the Army has their missiles. The Nike-Ajax and the Nike-Hercules constitute a point defense around our cities and around some of our SAC bases. We have the fighter interceptors, as I mentioned; we have Bomarc coming along, which will be a supersonic unmanned missile with a range of around 400 miles. All of these things the enemy knows and it certainly must impress him.

In addition to that we have our Army forces, our allies in Europe and in Asia. We have been spending billions of dollars arming our allies; they have air forces, they have armies, they have navies.

All of these things, in my opinion, add up to a very considerable deterrent in the enemy's mind. I think that history proves it must have been a deterrent because I have no question what his eventual intentions are. I have no question but what the Soviet Union intends to take over the world one of these days, whether by force or by cold war, I don't know. But he certainly is in an uncertain position today.

When we add all these factors together, we come out with the conviction that our forces, our defenses of the United States as of today and as covered by this year's budget are adequate.

All of us feel there are some things we would like to have to add on. That has been thoroughly discussed before the Senate Preparedness Committee, and notwithstanding that, it is our opinion that defenses are adequate for the period under discussion.

DETECTING VIOLATION OF A DISARMAMENT AGREEMENT

Senator WILEY. I have one other question which relates to your statement that you believe we cannot trust the Kremlin. Have you gentlemen been thinking about, or have you arrived at any conclusion about any mechanism, political or otherwise, which could lead to effective disarmament with people you can't trust?

General TAYLOR. We often say that the immediate problem is not so much military as one of the restoration of confidence and the reduction of the world tensions which create the fears which, in turn, create the need for armament. I am afraid we don't have any very useful suggestions practically as to how to proceed. If we had all the authority in the world, I am sure few of us would think that we would have the certain solution.

Certainly, any procedure which would initiate a feeling of progressive reconciliation between our top leaders in preparation for disarmament would be definitely good, if it could be achieved.

General WHITE. There is one fear that I have, Senator Wiley, that always bothers me. I think we are doing better, but this Nation is not sufficiently cynical. The Russians, the Communists, are the most cynical people on earth, I am proud of it, but I think it is to our disadvantage that the American people are frank, open, sincere, honest. The Russian, the Communist, is the greatest cynic on earth and I think our people somehow ought to be more educated in that respect although there has been great improvement in the last few years.

General TAYLOR. I might say that General Harrison, who conducted most of our negotiations at Panmunjom which terminated in the Korean armistice, wrote up 10 rules for dealing with Communists. The first one read: "Always bear in mind that the man facing you is a criminal."

Senator WILEY. What I really had in mind was the question of whether or not you feel that if an agreement were made, we would have the proper machinery to detect whether the agreement was being kept? In other words, if the Russians broke the agreement, would we know that they broke it?

General TAYLOR. You are referring to testing?

Senator WILEY. Yes, anything along that line.

General TAYLOR. Testing, of course, is more susceptible to detection than many other activities related to disarmament. On the other hand, our experts in the last year have become less confident of their ability to detect small yield bursts. And for that reason, as you know, our position at the Geneva discussions has changed somewhat.

General WHITE. I would like to be cynical, Senator. I question whether the Russians would even discuss this thing if they weren't sure they could cheat.

Senator WILEY. All right. That is all.

Senator LONG. Senator Humphrey, I believe I was the one who suggested that we limit ourselves in questioning the witnesses, but I want to ask some more questions later.

Senator HUMPHREY. I am going to ask Senator Hickenlooper, and Senator Lausche if they have any questions. We will ask the members of the subcommittee first if they have any questions.

Senator LAUSCHE. Yes, go ahead.

Senator HUMPHREY. Senator Hickenlooper.

Senator HICKENLOOPER. I think I agree that we have been discussing armament rather than disarmament.

Senator HUMPHREY. I would just interrupt to say that these are not exactly unrelated subjects. You cannot disarm unless you have arms, the theory being that you negotiate from strength. I think somebody quoted Churchill here awhile ago, to the effect that you parley from strength.

CAPABILITY OF OUR MILITARY STRENGTH

Senator HICKENLOOPER. With regard to our strength, and we have heard so much discussion pro and con, it seems to me that the object of military strength is to be able to reach the enemy with sufficient force to do him sufficient damage to at least come out on top of the battle.

Regardless of whether we have more intercontinental ballistic missiles than the Russians, or they have more than we have, we do have substantial quantities and substantial power in intermediate-range missiles, air-to-ground missiles, and in all the rest of the family of missiles, and it is a fact, isn't it, that we have the power today to reach any place within Russian territory?

General TAYLOR. That is my opinion.

General WHITE. That is correct, sir, with manned aircraft.

Senator HICKENLOOPER. Yes. And so far as all of Russian territory is concerned, except for a very limited area right in the center of the geographic land mass of the Russian territory which we might not be able to reach by intermediate-range missiles, we can reach it also with missiles launched from carriers, from land bases, and so forth, can we not?

General WHITE. I am afraid that is not true today, Senator. We can only reach all of the Soviet Union——

Senator HICKENLOOPER. I say with the exception of a limited area in the center or the heartland of Soviet territory, which we could not reach.

General WHITE. The IRBM force is quite limited today. We do not have a large IRBM force ready. The only effective force against the enemy today is the manned bomber and a few air breathing missiles which can reach roughly 700 miles from their locations.

General TAYLOR. I think, Senator——

Senator HICKENLOOPER. I was under a little different impression.

General TAYLOR. I would just say, summing up the question of the present adequacy of our general war retaliatory force, it is amply sufficient. We have a great variety of means, largely based on the manned bomber. And when you consider the effect of even a few hundred nuclear bombs, when you realize that fallout alone can be virtually fatal to the enemy, I am sure the enemy recognizes that we can destroy him, and if necessary will destroy him, and I see no diminution of our capability in the near future.

Senator HICKENLOOPER. Well, the basic point I was trying to test here is that we have the means to reach him.

General WHITE. Anywhere in his country.

Senator HICKENLOOPER. Anywhere in his territory. So whether or not we have intercontinental ballistic missiles that can be launched from this country and reach him, while that is very important—I wish we had many of them—nevertheless, we can reach him any place in his country with atomic weapons of various kinds, either fission or fusion.

General TAYLOR. And particularly when you consider the effect of fallout, there is no question of our ability to destroy him.

Senator HICKENLOOPER. Yes. So our power today, from all I can gather, is adequate to reach his vulnerable spots and to destroy him. We might suffer in the meantime, ourselves, of course.

On this matter of detection, in connection with disarmament, I have never been able to convince myself that there is any reliable detection system that can be established to determine whether or not the Russians would fudge on an agreement. Of course, we can come nearer detecting air bursts with more reliability than underground bursts. I have never been able to see how we could set up a limited number of detection stations in Russia and with any assurance at all know that we could find out whether they had been testing underground, if there were a determined desire on their part to conceal those tests, that is, if they wanted to go to the trouble of concealing them.

I don't believe I have any more questions at the moment, Mr. Chairman.

QUESTION OF SOVIET COMPLIANCE WITH A DISARMAMENT AGREEMENT

Senator HUMPHREY. Thank you very much, Senator Hickenlooper.

Senator Lausche.

Senator LAUSCHE. General Taylor, directing your attention to a prospective agreement for controlling the testing of nuclear materials, do I understand it to be your belief that the only time you can rely upon such an agreement is when it is self-serving to each of the signatory parties?

General TAYLOR. That is certainly the situation.

Senator LAUSCHE. Then it is your belief, on the basis of that statement, that so long as the situation and the agreement would be serving the interests of the Soviets, you could rely upon them in the performance of the agreement?

General TAYLOR. I would say that is correct.

Senator LAUSCHE. Well, that is at least one of the attitudes to be considered in approaching the question of the reliability of their compliance with any agreement.

OUR DETERRENT

Is it your position that at this time the course for our country to follow is one in which our military strength is so great that it will deter the Soviet from making any attack or performing any act of aggression against us?

General TAYLOR. Yes, sir.

Senator LAUSCHE. And to that end you would gear your efforts in this country to military strength definitely adequate to deter?

General TAYLOR. Yes, sir; to deter not only the direct general surprise attack, but also to deter aggression in smaller forms, which can become just as important as the big ones.

REASONS FOR DESIRING A TEST BAN

Senator LAUSCHE. Now, then, do I understand you correctly to say that, in your opinion, at this time the banning of nuclear tests would not be serviceable to the ultimate end of maintaining peace for our country?

General TAYLOR. It would be a definite military disadvantage to us in many fields, to some of which I alluded in my prepared state-

ment. It is rather hard to know whether it would be a greater disadvantage to us than to the other fellow. The question of comparative benefit or disadvantage is interesting to reflect upon. We think that we are ahead of the Soviets in our development of atomic weapons, so that the inducement to violate, I suspect, would be greater on their part.

Senator LAUSCHE. Then you do begin with this premise: That, being ahead, we could safely enter into an agreement if it would be obeyed by the Soviet.

General TAYLOR. If we were sure of its enforceability.

Senator LAUSCHE. And to be consistent, then, those who argue that the Soviet is ahead of us ought also to argue that the tests should not be discontinued.

General TAYLOR. That we should be allowed to catch up?

Senator LAUSCHE. Yes. Is that correct?

General TAYLOR. Yes.

Senator LAUSCHE. Then you begin from the simple base that the side which is now ahead should argue for limitation on tests of all kinds.

General TAYLOR. If sure that the other party would be obliged to obey.

Senator LAUSCHE. Yes.

Do you think that we are now ahead?

General TAYLOR. I think that is a fair statement.

We have been in the business longer. I am certain we have devoted great efforts to it insofar as weapons and the kind of thing I am referring to. I think it is it safe to assume that.

General WHITE. I think there is a difference here. I'd by cynical that if everything you two gentlemen have said be true, and accepting that the Russians are really smart and we think they are, then they must have come to the same conclusion.

Therefore, I ask why do they even propose cessation of testing unless they are ahead.

Senator LAUSCHE. Unless they are ahead?

General WHITE. Unless they are ahead. That is the unknown. But if you follow that line of reasoning, you can come to that conclusion.

Senator LAUSCHE. They think they can win both ways.

General TAYLOR. I think that is the point you are making, Senator.

Senator LAUSCHE. Yes.

General TAYLOR. If we are ahead and they are behind, we lose by a ban because we will obey and they may and probably will cheat. If they are ahead and we are behind, then the agreement freezes us and we still lose.

Senator LAUSCHE. And we are stuck.

General TAYLOR. Because we won't cheat.

Senator LAUSCHE. Anyhow, those who advocate that an abandonment of tests would serve our country do so only in the event they definitely conclude that we are now militarily stronger.

General TAYLOR. And have ways of detecting violations.

Senator LAUSCHE. Yes; all right.

PROBLEMS OF TEST DETECTION

With regard to the discussions that are now going on about the banning of tests, do you feel that we can work out a satisfactory agreement on that?

General TAYLOR. That is something experts will differ on, Senator and something about which I have great reservations. However, it always seems to me that the checking on violations of testing probably would be the easiest area in which we might accept armament restrictions.

But now we have information which leads us to believe the detection of violations is not as simple as we thought.

May I read a little?

Senator LAUSCHE. Yes.

General TAYLOR (reading):

> The present acoustic system has detected Soviet tests in the low kiloton range. [Deleted.]
>
> Underground bursts in the low kiloton range can be detected. However, it is difficult to differentiate between nuclear bursts and earthquakes. Data from the recent Nevada tests indicate that this problem is more difficult than that previously believed. All above-surface tests will produce radioactive debris which, if collected, will indicate that a test has taken place, but not its location.
>
> Further, even should such nuclear activity be detected, it might not be sufficiently definitive to present as evidence at an International Control Board.

So I make the point that there is an uncertainty now.

MILITARY EFFECT OF A TEST BAN

Senator LAUSCHE. From a military standpoint, would you subscribe to the banning of tests on the basis of your knowledge of what further work has to be done by our Government?

General TAYLOR. No, we definitely have a great deal of unfinished business.

Senator LAUSCHE. But, from a political standpoint, are you willing to express an opinion?

General TAYLOR. No, I am not; although I recognize that anything which will create some confidence between us and the other fellows and reduce tensions obviously is a fundamental step forward. Hence I would not close my mind to the desirability of agreement in any of these fields.

But I am certainly aware of the hazards involved in these negotiations.

RELATIVE MILITARY STRENGTH OF UNITED STATES AND U.S.S.R.

Senator LAUSCHE. Now, one or two further questions. It is conceded that in the field of intercontinental ballistic missiles, the Soviets are ahead of us at this time.

General TAYLOR. Based on such intelligence as we have, I think that is a fair statement. [Deleted.]

Senator LAUSCHE. As a matter of logic, assuming they are ahead of us on intercontinental ballistic missiles, would it follow that they must also be ahead of us on shorter range missiles?

General TAYLOR. Not necessarily so, but I think it is fair to say they have been very active indeed in the whole missile field from the short range to the long range.

Senator LAUSCHE. Would you express an opinion on whether we are equal to, or superior to, the Soviets in the field of the intermediate missiles?

General TAYLOR. Numberswise I suspect they probably have more than we do. [Deleted.]

Senator HUMPHREY. Maybe General White has an observation on that.

General WHITE. It is my impression we concede they are ahead of us in numbers.

Senator LAUSCHE. In IRBM's?

General WHITE. Yes.

Senator LAUSCHE. And ICBM's?

General WHITE. As of the moment probably they are slightly ahead, or to put it another way, "could be," I believe is the way the intelligence people put it.

Senator LAUSCHE. Where does our superior strength then develop, if they are equal to or ahead of us in these first two categories? On the basis of armed forces, they have 2 million more men with their bloc than we and our allies.

General TAYLOR. More than that.

Senator LAUSCHE. More than that?

General TAYLOR. Yes. Actually, their army is about 2.6 million and we throw in——

Senator LAUSCHE. What I mean is that they have 2 million more, contrasting their entire body of armed men against our entire body of armed men.

General TAYLOR. That is about right; military population of the two blocs.

Senator LONG. Do you include the Chinese Army in that statement?

General TAYLOR. Yes.

Senator LAUSCHE. That is correct, because I think there are 8 million in the combined forces of the Communist bloc and we have 6 million in all of our combined forces. That is what testimony the other day indicated. Now where do we develop the strength in our Allied forces in which we overcome their superior strength in intermediate and intercontinental ballistic missiles?

General TAYLOR. Generally speaking, I think it is in our manned aircraft, both the long-range and the tactical aircraft General White referred to. These have an atomic capability and represent very substantial numbers; in combination they can destroy Russia if it ever becomes necessary.

PRESENT AND FUTURE DEFENSE REQUIREMENTS

Senator LAUSCHE. If you were in a political position like mine, to what effort would you today direct your primary attention with reference to your country?

General TAYLOR. In the question of defense?

Senator LAUSCHE. Defense.

General TAYLOR. I would verify the balance in our defense. I would not be fascinated solely by the great danger of general war deliberately initiated on the part of the Soviet.

I cannot believe they would do so deliberately.

I do think we have many areas of weakness in meeting the cold war and the limited war threats which have not been properly attended to.

Senator LAUSCHE. Do you have anything more to add to that, General White?

General WHITE. I would look to the future and for the period covered by the 1960 budget.

I think we are satisfied the forces can do their job. But what does the future hold, because things are changing very rapidly.

Intelligence can give us a different picture. Technological breakthroughs can totally alter the picture.

IMPORTANCE OF TECHNOLOGICAL BREAKTHROUGHS

Senator LAUSCHE. In looking to the future which you envisage, to the prospect of a quick breakthrough with some new type of weapon that will be superior to the existing types, do you think therefore that it would be unwise to make huge investments in existing weapons that might become obsolete?

General WHITE. I think that technological breakthroughs could occur either on their side or on our side which could radically alter the mix or the direction in which we ought to be going in our defensive forces.

Senator LAUSCHE. You would direct your attention to the maintenance of a military defense that would be adequate definitely to deter the Soviet; is that correct?

General TAYLOR. Both for general and limited war.

Senator LAUSCHE. General and limited war.

Now, this is my own concoction, but I want to get it into this record: If you were in my position and you had to decide on spending money for defense or for desirable, but not essential, domestic civic projects, and to that extent taking that money away from the defense of the Nation, in which place would you put it?

General TAYLOR. That is not hard for General White and me to answer.

Senator LAUSCHE. Well, answer it.

General TAYLOR. Obviously we would support the defense of our country. That would come first.

Senator LAUSCHE. That is, if you think your house is to be burned down, or your house robbed, you would quit thinking about buying furniture and rugs and luxuries to ornament the house, but you would put your money into defense of the house.

General WHITE. Yes, sir. I have got to add this about being burned down. It can also fall down by being eaten by termites.

Senator LAUSCHE. Good enough. I agree with you about that.

Senator HUMPHREY. Senator Carlson.

Senator CARLSON. Through the kindness of you, Mr. Chairman, I may have one or two questions. I am not a member of the subcommittee but I certainly appreciate being in attendance this morning.

Senator HUMPHREY. We appreciate your being here.

Senator CARLSON. I want to follow Senator Lausche's thoughts, which have been a concern of mine. In this defense picture, we are continually, through science and technology, improving our weapons. I was at Boeing Aircraft in Wichita when they rolled the first B–29 off the line.

I have seen the B–29's, B–36's, the 47's, the 52's, and now the 52–G, and what concerns me—and I ask this question because of Senator Lausche's leading up to it—is this: In view of this improved defense posture through science and technology, must we not be careful not to just try to stockpile something that we have at present without spending great sums of money to stay current or at least to go forward in the picture.

General WHITE. A very serious problem with the military, because if we go into a project it costs money to develop almost anything.

When we abandon it, we get criticized. But I know of no other way to do it except perhaps we should be a little bolder in cutting off some of the developments earlier in the game. But even so, there will be some hundreds of millions of dollars lost in a certain sense every time that is done, because it takes money of that order to decide to reach a point where you may find that a better weapon has overtaken it.

So there is something that we are very much concerned with where money is limited, as it always is and should be.

Senator CARLSON. General, I think that is one of the problems that we really face as Members of the Congress. It is easy to say "Well, let's build airplanes."

We can fly down to Texas and see B–36's parked in substantial numbers. You can say they are in our military defense posture and picture. But we must, in my opinion, not hesitate to spend money for new development.

I am convinced, after having watched this for the last 10 or 15 years, that it is all right to say "Let's stock up with tanks," or "Let's stock up with airplanes," and maybe, General Taylor, we might say we ought to have more divisions. But, after all, there are only so many divisions, as I see it, that you can use. I appreciate the testimony here this morning which has helped me very materially along the line that I think we have to leave this matter to our men in these positions who are responsible for our defense and hope that they will not be hesitant in developing new things.

I am going to stop right there, Mr. Chairman.

Senator HUMPHREY. Thank you very much, Senator Carlson. That is a very fine contribution.

Senator Morse.

IMPORTANCE OF A STRONG DOMESTIC ECONOMY

Senator MORSE. General White has suggested that we be cynics. General, I am so cynical that I make you look like an optimist.

General WHITE. I'm glad to hear that, sir.

Senator MORSE. I think the only people who are ahead of the Russian military leaders or the American military leaders are the archeologists of a thousand years from today. They are way ahead of us.

You cannot possibly follow the course that you gentlemen are talking about and win. I am no fearmonger and this civilization is not going to be saved by appealing to the American people's fears. We have a constructive job to do here. I am not at all concerned with Senator Lausche's great concern about the house falling down. You hadn't better let your domestic economy fall down, Senator, or you will lose the greatest weapon you have.

36042—59—pt. 1——10

Senator LAUSCHE. It doesn't have to.

Senator MORSE. It will, if you sacrifice the domestic needs.

Senator LAUSCHE. It can fall down in two ways, by spending foolishly——

Senator MORSE. You beg the question by putting in the word "foolishly." The domestic economy had better be kept strong.

FALLOUT DANGER

My first question to either one of you gentlemen or both is this: What do you want to put in the record about the contentions in regard to increasing nuclear fallout dangers.

There is increased danger on the part of nuclear fallout throughout the world. There has been testimony that it isn't good for the health of mankind and does not augur very well for the future.

General TAYLOR. I think the scientists themselves differ on that point. I have never seen anything that has convinced me that testing thus far has been a serious hazard, other than the fallout during one of the early tests at Bikini.

The point which to me is a very strong argument for continued testing is that it may be suicidal for the military forces to use these unfamiliar weapons, with as little knowledge as we now have of their effects.

Senator Long, you will recall we conducted a large Army maneuver called Sage Brush down in Louisiana about 3 years ago where both the Army and the Air Force were assumed to use tactical atomic weapons freely. [Deleted.]

Insofar as the fallout hazard in case of the large-scale use of these weapons in general war, there is no question but what it is a tremendous menace to populations.

General WHITE. Could I inject something there, sir?

Senator MORSE. Yes.

General WHITE. The hazard of fallout is one that certainly I am not competent to discuss. I think we may have a national guilt complex, having invented the atomic weapon, and we may be inclined to be a little idealistic in our approach to it. But the point I wanted to make is that no matter what we do to make clean weapons, the real answer depends on the enemy, too, because no matter how we control it, if he doesn't, it cannot be controlled.

Senator MORSE. Mr. Chairman, I would respectfully like to make one suggestion to your subcommittee. I hope that this year you will see to it that there is as thorough a job of investigating as can be done by appropriate experts on this whole matter of the danger which continued testing will have on future generations of human beings. We have to keep in mind peoples other than the peoples of Russia and the United States. I think you could have a terrific effect in directing the course of action when there is a meeting of the heads of states of the United States and Russia.

I am inclined to think that neither country is going to issue the orders 20 years from now as to the defense policies of the two countries. I think that as millions of people in other areas become more enlightened about this armaments race, we are going to hear from them and they may be the check on us that we need. But one of the great moral weapons we would have would be a factual finding

in regard to what the effect of this continual nuclear preparation is going to have on the health of mankind.

When you once get the people of the United States and the people of Russia, India, China, Great Britain, and elsewhere informed on whatever those facts may be, you will see government policies change in a period of 10 years. You are not going to do it overnight. But I want to say that underneath all of this there is a great moral defense to which we had better pay some attention, because eventually the people of this world are going to hold accountable any nation—whether it is the United States of America or Russia or some other country—following a course of action which cannot be squared with the moral law. You cannot continue this armaments race and square it with the moral law. That is all.

Senator HUMPHREY. Thank you very much, Senator Morse.

I believe the time has arrived now where I might do a little questioning.

We have adhered to a good time schedule and this has worked out very well. I want to thank my colleagues. I have a few technical questions I should like to ask you, gentlemen.

The first question that I had was, are we ahead, and I think that has been discussed enough, so I shall not go into that any further.

IMPACT OF UNILATERAL CUTBACKS IN MILITARY STRENGTH

One of the points that has always concerned me—and I realize that you gentlemen do not make the political decisions, nor do you testify in that capacity—refers to our arms cutbacks here at home. You announced today, General Taylor, that there is some cutback in our divisional strength—I believe from 15 to 14 divisions—is that correct?

General TAYLOR. That is as a result of the 1959 budget.

Senator HUMPHREY. What about fiscal year 1960?

General TAYLOR. It retains the 14 divisions, 870,000 currently.

Senator HUMPHREY. Do you lose any manpower?

General TAYLOR. No, in terms of manpower and units, there is no real change in our structure.

Senator HUMPHREY. One of the points that I tried to discuss freely with one of the witnesses on last Friday was to the effect that when we know in our budget planning, as we do know months ahead of time, what the result will be in terms of the financial requests made of the Congress, why don't we have the good sense to initiate some discussions with the Russians on the basis of a mutuality of reduction in strength? We have been unilaterally reducing strength through the Bureau of the Budget.

We have been doing it on our own. We haven't negotiated any disarmament agreement, but we have negotiated some disarmament here in Washington with ourselves. When we were getting ready to cut back a certain amount of naval, Marine Corps, and Army strength, why wouldn't it have been a good idea to have initiated discussions with the Soviets, even if they came to naught? At least psychologically we would have been before the world in the image of one that is seeking a mutuality of reductions of military power. As it is, we have had the unique experience of having the Director of the Bureau of the Budget or somebody else unilaterally disarming us with no oppor-

tunity whatsoever to make even a good name for ourselves in the world in terms of pressing the Soviet for similar agreements.

General WHITE. That has some appeal to me, Senator.

Senator HUMPHREY. It has a lot of sense to it, as a matter of fact.

General WHITE. I am thinking of it perhaps in reverse. I am sure the first thing the Russians would say is that "qualitatively you haven't reduced," and their discussion of the qualitative aspect would be of great value to our own people.

Senator HUMPHREY. From an intelligence point of view.

General WHITE. The very discussions would make our own people realize that the Russians thought we had something.

Senator HUMPHREY. I think it has many advantages.

Senator MORSE. It is very important.

Senator HUMPHREY. At least this is a point that I insist on bringing into the record because I do not think we have taken full advantage from the psychological and political side of what we have been doing ourselves.

WITNESSES' VIEWS AS CONTRASTED TO ADMINISTRATION POLICY

Now one statement that Senator Morse referred to, General White, related to the cynicism which you have and which I would say is, I think, somewhat characteristic of people who are in responsible positions.

After all, we know that the Soviets have broken many agreements. We know that they are difficult to deal with, if not impossible on occasion.

General WHITE. I lived there for a year or two, Senator.

Senator HUMPHREY. And we know we have tremendous problems. But if your cynicism is grounded in fact, and based on experience, why aren't we asking for more power instead of less? Now you have been down here, gentlemen, pointing out to us this morning, in contradiction to an administration position, the limitations and the weaknesses and the risks involved in a suspension of nuclear tests.

Now I am not critical of you; don't misunderstand me. As a matter of fact, I think that if you feel as you have expressed yourself, that you feel that we ought to be forewarned, you have an obligation to tell the subcommittees and the committees of Congress.

But, as you know, our official policy, after taking into consideration all of these many doubts which you have raised, is that we still are pursuing the objective of agreement with the Soviet Union to ban nuclear tests.

That is what the conference in Geneva is about.

Now you have openly challenged that decision.

General TAYLOR. I have not.

Senator LAUSCHE. I do not think that that interpretation should be put on this testimony.

Senator HUMPHREY. I haven't finished my statement.

I say that by your testimony you have raised doubts. You have pointed out the risks involved, which is what I have said you should do.

General TAYLOR. I would say my position is this: I am not saying that we should not continue discussions. I expressed the fact that if we could find procedures which were safe, certainly by relieving world tensions, the political and psychological advantages would be very

material. Very properly, I think, we have directed our comments here to the military consequences.

Senator HUMPHREY. Exactly. But I do not say that the dangers are so great that——

Senator LONG. If I may inject a point about Administration policy, I believe the General's position is that he is not testifying contrary to the position of the Administration.

As a matter of fact, if the Administration decides to make that agreement, he may be instructed not to testify contrary to that position. But while he is free to do so, he wants to make clear what he thinks the hazards are.

Senator HUMPHREY. And for this I was commending him, not chastising him. You are indeed opening up for us some of the limitations involved here and some of the risks, both in the cutoff in the production of nuclear materials involved in the testing and in what it would mean to your weapons development. You have answered very frankly a whole series of questions which we placed before you.

RELATIVE MILITARY STRENGTH OF U.S. AND U.S.S.R.

Now I go back to the point of cynicism. If we are cynical about the fact that the Soviet would ever keep these agreements, it seems to me that the same degree of doubt ought to be raised as to the relative power that we have in the world today with the Soviet Union.

There has been very frank discussion here of the weakness of the test ban—what it would do to weapons, how it might slow up weapons development—all of which I think we need to know.

Now many questions have been asked here today about the relative power position of our two countries, and all I am saying is that if we are so doubtful as to the willingness of the Soviet to ever keep an agreement, then indeed the same kind of doubts ought to be raised as to our relative power position with the Soviet Union.

Senator LAUSCHE. Our relative power?

Senator HUMPHREY. Our relative power position.

In other words, we have had a tendency to gloss over here this morning what some people feel—and I am not an expert in this—are the weaknesses in our ICBM position.

With regard to the questions asked by Senator Lausche as to the weaknesses in our intermediate range missile position, we have compensated for our position in that field by saying, "Look, we have bases. We do not think the Soviet Union is going to go to war."

Well, that is an assumption that you can make only on the basis of the theory that our deterrent power is so strong that they undoubtedly would not start a war.

You see, what I am getting at is that we use many protective assumptions here that we did not use over in the weapons testing field.

General TAYLOR. I would never associate myself with the general statement that the Soviets are never going to war at any time. They are at war now in a sense.

Senator HUMPHREY. I was referring to a military conflict. I think the statement was made in the record that they would not deliberately initiate a general war.

General TAYLOR. A general atomic war.

Senator HUMPHREY. That is right.

Well, I say that is an assumption; that is all. There is no fact to guarantee that.

General TAYLOR. No. It is simply my feeling that when you look at our deterrent strength, which we have been commenting on in all its facets, it would insure the destruction of an aggressor who initiates a general war.

ARMY WORK ON DISARMAMENT PROBLEMS

Senator HUMPHREY. General Taylor, you said something about this Louisiana military exercise.

General TAYLOR. Sagebrush.

Senator HUMPHREY. And you pointed out that in your calculation as a result of that exercise we knew far too little about the deployment or use of tactical weapons and their effect.

General TAYLOR. That is right.

Senator HUMPHREY. General, what is known today about what would happen to Louisiana if tactical atomic weapons are actually used?

General TAYLOR. We have gained very material knowledge through the testing which has gone on since then—which was 3 years ago—both in Nevada and in the Pacific.

We have had large numbers of tests so we are not as ignorant as we were then.

There are still many gaps, however, in our knowledge.

Senator HUMPHREY. Have you set up in the Department of the Army or in your establishment any group of technicians working on the subject of detection and identification of nuclear weapons explosions, or working with Mr. Foster and his group on the matter of surprise attack?

General TAYLOR. We have not set up a specialized organization. Our whole staff is equipped to deal with those matters as they affect the Army.

Most of the detection apparatus does not pertain directly to Army.

Senator HUMPHREY. Did you have an officer at the Geneva discussions on suprise attack and at the nuclear test ban conference?

General TAYLOR. Yes. Colonel Lemley, who is present.

Senator HUMPHREY. Did you have any representative at the nuclear test ban conference?

Colonel LEMLEY. I was not, sir. I believe the Air Force had a representative at the latter, sir.

Senator HUMPHREY. Yes, I know they did.

What I am getting at is that the Chief of Naval Operations testified here the other day to the effect that in the Navy they had now established a separate group of technicians working on this whole subject matter of test detection and identification, as well as on the methods which might be utilized or developed to forewarn of surprise attack. This is a separate group that I believe Admiral Burke said was being established in the Navy.

I wondered whether the Army had done the same.

General TAYLOR. We are not sufficiently involved to warrant a separate group. We are represented appropriately in all gatherings.

AIR FORCE WORK ON DISARMAMENT PROBLEMS

Senator HUMPHREY. How about you, General White?

General WHITE. We do not have a special section, but we do have experts in the field insofar as we have experts who work on these problems.

Actually, for the surprise attack conference we had 15 Air Force officers, 10 of whom went to Geneva, including 1 who is a member of the plenary group.

General Weyland was with Mr. Foster. Each of the three services had a senior adviser, and in addition to that, I think they each had 5 or 10 officers in the various subgroups at Geneva.

We also had a representative at the suspension of nuclear tests.

Senator HUMPHREY. Are you going to maintain those specialists working on these problems?

General WHITE. They will; yes, sir.

Senator HUMPHREY. Did you have a chance to discuss the surprise attack conference with Mr. Foster?

General WHITE. I was absent at the time Mr. Foster discussed it, but the Vice Chief of Staff was present. I have discussed it with General Weyland and I have personally discussed it with Mr. Foster informally.

General TAYLOR. The point of contact with Mr. Foster is not through the services, but through the Joint Chiefs of Staff.

We have had numerous conferences with Mr. Foster and his people.

Senator HUMPHREY. You understand that Mr. Foster feels this was a productive conference in terms of the information we were able to gain.

General TAYLOR. Yes, sir.

Senator HUMPHREY. And he feels that the experts should continue to apply themselves to these problems that were raised.

General TAYLOR. And we are prepared to continue to support him insofar as military personnel is concerned.

Senator HUMPHREY. It seems to me that one of the needs is for a real dedication and determination on the part of our scientific community and our military services really to explore all possibilities of surprise attack. I believe this is what Mr. Foster's statement indicated that he was recommending.

Now whether there is the same zeal for that as there is for some other things is a matter about which only time will tell.

DURATION OF THE ARMS RACE

What do you think is the culmination point of this arms race? How far will it go?

General TAYLOR. That is very hard to say. It has been a question that history has faced for a long while. Armaments undoubtedly do tend to create counterarmaments.

Until the tension is relaxed, however, I think that we must have a sufficiency of weapons in a number of categories, not just in one, but across the board, so that the attractiveness of the use of force to settle issues will decline or even disappear on both sides.

NECESSITY OF PREVENTING OCCURRENCE OF A NUCLEAR WAR

Senator HUMPHREY. I gather that you said, General Taylor, that you felt, along with this matter of maintaining the deterrent power in the balance of strength, that continuing emphasis should be placed upon the political and the diplomatic efforts——

General TAYLOR. Very much so.

Senator HUMPHREY. To ease these tensions, and which could thereby provide a climate in which arms reductions might be made.

General TAYLOR. Yes.

Our deterrence is really just an improvised solution—it is certainly far from an ideal one, until men's minds are changed and we develop an ability to live with each other without destroying each other.

Senator HUMPHREY. When you listen to the testimony which we had this morning—which is very excellent testimony—you come to the conclusion that if there is a war, there will be quite a question as to who will win it.

General TAYLOR. In the case of general, unrestricted, nuclear war, there is no question about the hazards and doubts.

Senator HUMPHREY. Therefore, with that awesome possibility before us, the urgency of attempting to find means and ways of preventing this is surely of top priority. And secondly, the ways and means of reducing tensions should have equal priority.

General WHITE. We both subscribe to that.

General TAYLOR. Yes.

I would like to add the point which has not been made, I do not believe, though it has been alluded to, that as this general atomic war as a deliberate act of policy becomes more and more unlikely, it does not mean we are not going to be challenged and provoked by the Soviets on other fronts. If we yield and concede enough in these little affronts, we can end up by being nibbled to death rather than being consumed in atomic fires.

General WHITE. I feel I must inject something there. I do not feel we should ever lose sight of the fact that all out war is the greatest danger, and that we must protect ourselves from that as the primary national problem.

General TAYLOR. We argue this quite a bit in the Joint Chiefs. I do not think anyone disagrees as to the continuing requirement for a visible strength in the general war field so the other fellow will never be inclined to seek that solution. But I do not think that ends the problem.

Many people say that is all and walk away from the problem of balanced security. To cope with general war is a piece of the problem, a very important one, but not all.

SOVIET THREAT POLITICAL AND ECONOMIC, AS WELL AS MILITARY

Senator HUMPHREY. I thought your answer, General Taylor, to Senator Lausche, in reference to what you would advise, was a very appropriate one. You advised that we should have a balance of forces to deal with the possibilities of limited conflicts, and as well as general war, that on the political-economic front we ought also to be prepared.

General TAYLOR. That is right.

Senator HUMPHREY. One of the things that disturbs me at this particular hour is that while I recognize that the ICBM picture is vital—and I surely do—and while I recognize the importance of the intermediate range missile—and I certainly do—we haven't had any of those fired at us yet. But the Soviets just dumped a load of aluminum not long ago, and we had a batch of tin dumped that practically wrecked the South American markets.

We are about ready to get a whole batch of scientific material dumped on us in this market that can adversely affect practically every producer of that material in the United States.

And while we are holding these hearings on ICBM's, which is all very important, in the meantime these Soviets are moving right in on the political and economic front and giving us a first-class working over.

DESIRABILITY OF SAFEGUARDED DISARMAMENT

I have just one other question. I think you gentlemen are rather familiar with Adm. Charles Brown, one of our great officers. He said: "We know that we would never start any * * * nuclear war. I think it is equally clear that an enemy would never dare."

This is to what you gentlemen have testified this morning.

Admiral Brown continued to say:

> For this reason, it is my belief that a nuclear war will never come—unless it comes as some last wild act of despair by a desperate, tottering dictatorship. We must maintain our nuclear capability. * * * Further, and just as important, it must be always made abundantly clear to an adventuresome enemy that we do have the power to destroy him, no matter what degree of surprise he may achieve. If this be done, I believe we will continue to live under an umbrella of real but unrealized fear.
>
> Under this umbrella of fear, I can even foresee * * * wars of the future being fought with conventional, but always improving weapons. If [man] cannot fight with nuclear weapons, he will go back to using the gun or something else. But if the dangerous situation of a war with conventional weapons should, one day, come to pass, man must * * * keep all such wars limited in scope.

Now what this gentleman is saying in substance is that nuclear war is such an extreme possibility that the possibilities of struggle are more or less focused within what has been called the conventional pattern. This goes back again to a very important matter relating to testing. Are we ahead in atomic weapons today, in design, number and diversity of arsenal?

Senator LAUSCHE. And accuracy of reaching the target.

Senator HUMPHREY. Yes; and their sophistication.

General TAYLOR. I think we can say we are.

General WHITE. I believe we are.

Senator HUMPHREY. Are we substantially ahead?

General WHITE. I think we are substantially ahead.

Senator HUMPHREY. If that is the case, gentlemen, why wouldn't it be an idea to put a halt to testing them so there could be little or no further perfection of such weapons? I think there is some truth in the idea that the Soviets have been gaining, because there was a big gap. I say this not to be critical of what we have done, but it is just obvious that as power comes into being, scientific know-how gains more rapidly for a period of time, so the Soviets have been closing the gap somewhat.

General TAYLOR. I think there would be logic, Senator, in accepting your observations if we were sure that we could detect violations.

Senator HUMPHREY. So it gets down to this question. Here is what I was trying to develop: It gets down to the question of the efficacy of the detection and identification system; is that correct?

General TAYLOR. That is very largely correct.

General WHITE. I think that has been the burden of both of our testimony. If we have safeguards, these things are desirable.

Senator HUMPHREY. Gentlemen, it has been the burden of your testimony, but I wanted to get this down where the emphasis of the testimony might well be for this particular subcommittee.

You are distinguished and admired chief officers of our respective service branches. You are here with your duty to protect and defend the country. At the same time, you are testifying to possibilities of arms control.

What you are saying—and I merely want to put it in focus—is that you are not advising against these matters of disarmament provided that, first, we recognize the nature of the enemy we are dealing with, and secondly, that if there is devised a system with a degree of efficacy and of accuracy in terms of detection and identification so that it will work, then the matter of arms control becomes something that, in your view, is manageable and desirable. Is that correct?

General TAYLOR. Insofar as testing is concerned.

Senator HUMPHREY. As to testing, that is the real issue.

General WHITE. A very high degree of accuracy.

Senator HUMPHREY. The other question involved in this is what one of you gentlemen referred to earlier. That is the balancing off of the technical aspects with the political. I think the idea of the people in our State Department who are presently pursuing this course at Geneva—and I am sympathetic to what they are attempting to do—is that there may be more value in trying to ease some tensions, in getting the beginning of an agreement and the beginning of an inspection system, than there is danger in the risk of some cheating on small tests.

I think this is what the decision has been based on.

Now, that is always a value judgment. There is a value judgment involved there, I gather that you feel, General White, that the value judgment as to pursuing such a test system would be based finally on the efficacy of the system.

General WHITE. That is right.

I agree there may be some initial steps that have a certain easing of tensions, but before we sign on an irrevocable dotted line, we must be sure that it is going to work.

General TAYLOR. Easing of tensions should logically precede disarmament. Disarmament should reflect the increased confidence on both sides.

POSSIBILITY OF NUCLEAR WAR OR LIMITED WAR

Senator LONG. Senator Humphrey, might I ask one thing about your previous question? You read from Admiral Brown's statement. I would like to know if the general agrees with that statement.

General TAYLOR. I would in general agree with it, yes.

Senator LONG. Are you in agreement, General White?

General WHITE. I think I ought to point out that General Norstad, commander of SACEUR, has stated his whole posture is based on nuclear capability.

Senator LONG. You do not agree with that statement, then?

General WHITE. I do not go as far as he does; no, sir.

Senator HUMPHREY. Admiral Brown's statement was based on the possibility that nuclear weapons would not be used for political reasons.

Senator LONG. I want to pin that down because I think that is extremely important in an understanding of the problem.

Admiral Burke testified that a limited war was more likely than a general war, and I just want to know if the Air Force also agrees with that.

The Army apparently does, because that is consistent with what Admiral Brown testified to, although not in the same language.

I would be curious to know if the Air Force thinks that is likely or unlikely.

General WHITE. That is a difficult one for me to get out of the circle on, because I believe that each limited war raises the possibility of expanding into general war, so I just cannot break out of the circle there.

Senator LONG. Frankly, it seems to me that there is no conflict, because the fact is that the best way to be sure you are not going to have to fight a nuclear war is to be capable of fighting it.

General White. I think that is basically the point.

Senator HUMPHREY. And the other thing, in the view of some of us, is that while we want to be positively sure of having the capability of fighting a general nuclear war, we do not want to concentrate our defenses so much on that that we are not prepared to fight limited wars. Well, that is an argument that will rage in the Congress for some time. I happen to be somewhat on the side of more adequate preparations in the field of conventional weapons as well as in the other.

General WHITE. I shouldn't oppose that either, Senator. The only thing I say is we must have as the primary requirement adequate forces for general war.

Senator HUMPHREY. Senator Long.

A BIPARTISAN DEFENSE POLICY

Senator LONG. I have a point I would like to ask about here. I could question these two witnesses on it for an hour and then we probably still would not be through. But I would like a chance sometime within the next couple of weeks to get their answers.

You were asked to suggest to those of us in public life what we should do or what we could do with our responsibility. Frankly, it seems to me that about the best thing we could do, if we could get cooperation from the administration and from the other side of the aisle, is to try to get some understanding between the leaders of both parties to see if we couldn't agree upon a bipartisan defense policy, just as leaders on both sides try to have a bipartisan foreign aid policy.

I haven't quite subscribed to the bipartisan policy on foreign aid, but if the leaders on both sides agree, the steam roller, as we say, just rolls on each year.

I am sure you realize that there is no bipartisan defense policy.

General TAYLOR. I think that is clearly evident.

Senator LONG. Would you be one of those who would feel that it might be desirable to have a bipartisan defense policy of both Democrats and Republicans—that is, a policy that the majority could agree on?

General TAYLOR. Certainly we military witnesses feel very keenly the fact that from time to time we are put in the cross fire between the two parties on issues which are of national importance. Meanwhile, we are not coming up here to give Democratic testimony or Republican testimony, but just tell the truth about things as we see them.

Insofar as our leaders of Congress can take time to sit down and analyze these very complex problems I think it most profitable, because a superficial view will not give the full picture.

Senator HUMPHREY. That is right.

CUTBACK IN ARMY DIVISIONS

Senator LONG. General Taylor, here is one point that occurs to me. You mentioned that you are dropping one of your divisions in the 1959 budget, and I have some idea as to why that happened, I believe. I do not want to ask you this question if you are not free to answer it completely and frankly, and if to answer it you would have to testify contrary to some directive or something of that sort, I would rather you would say "Senator, I would rather not answer the question." I think there is nothing worse than to have somebody throw sand in our eyes because he is not privileged to answer the question.

Senator HUMPHREY. May I just say that we passed a bill in the last Congress that authorized and directed the service chiefs to answer questions relating to these matters. Somebody brought this to my attention just this last week, but we have not brought up the subject.

Senator LONG. But let's not kid each other. I confronted the Secretary of Defense with a statement made by General Dahlquist—and the press was sitting here and heard this—which was contrary to the decision being made, and he said, "Where is General Dahlquist now," which meant in effect, "If he is working for me, I'll fire him." So I understand something about how these things work.

And if you would have to testify contrary to some directive, I would rather you would just say, "Senator, for reasons that I hope you understand, I would rather not answer it," and I will take my question off the record.

I would like to ask you this: Did you recommend in your budget the dropping of that division?

General TAYLOR. Let me go back to your original point. I appreciate your consideration. I can assure you there is no directive that prevents a military witness from telling the truth about any subject on which he is interrogated by Congress. The so-called gag rule does not exist so far as I know, and never has. This year the ethics of testimony are what they have always been. I am not here—and I am sure General White will say the same thing—to undermine the administration budget or to urge Congress to change the decisions by the Secretary of Defense and the Commander in Chief which have been taken in regard to the budget or any other matter.

Senator HUMPHREY. Do you have any objection to our seeing that directive?

General TAYLOR. It is not my directive. I do not have it.

Senator HUMPHREY. So actually it is not your decision whether we see it or not. Is that what you are saying?

General TAYLOR. That is right. I do not have it, literally. Now, what you have asked me is very easy to answer because I testified last year on the 1959 budget that I had recommended to my Secretary a 925,000-man Army, which would have been a 15-division Army and that recommendation was not taken in that we came out with an 870,000-man Army and 14 divisions.

Senator LONG. Actually in the Senate we wrote the 15 right into the appropriation bill and then it got to conference and someone said, "That is legislating in an appropriation bill; let's put it in a committee report," so the committee report says, "Here is the money for the 15 divisions, it is for a 900,000-man Army."

But you do not have the 900,000-man Army. You are told you cannot spend the money for that, even though we appropriated the money for that purpose.

Frankly, as a Senator and as a Member of the Congress, I feel a little upset about that because the Constitution says that Congress shall raise the Army, and mind you, it does not say Congress shall appropriate the money for raising it. It says "raise it." This responsibility is placed on us.

Now, our Commander in Chief has the power to command that Army, and as a uniformed man, you are going to obey him and not an order of the Congress when it comes down to taking your orders. But we are the ones who raise that Army, and that responsibility is placed explicitly on us and not on the President.

He can veto our legislation, but when that becomes law, it is the Congress that has that responsibility. It just seems to me that one of the first things we need if we are going to get anywhere is to get some understanding between the Executive and the Congress and between the Democrats and Republicans, at least at the leadership level in Congress, as to what we are trying to achieve here.

Now, as far as that particular decision is concerned, we have the situation of Congress trying to raise an Army of 15 divisions but not getting this done. Some may say the President is stopping it. It looks to me as though it is more a case of someone in the Bureau of the Budget saying we just have so much money, so notwithstanding the Constitution, we cannot do it.

WILL THE UNITED STATES FIGHT A WAR, IF NECESSARY?

Do you have any doubt that the Soviets are never going to take the United States by methods short of war? You know people say some day they will take us, that we will lose the war without fighting. The way it is going now, small countries will fall. But do you ever have any doubt that no matter how many small weak countries fall from subversion or from economic measures, they will have to fight to take this one?

General TAYLOR. It is very hard to see down the road, but I think there is a very definite danger that if we lose area by area in cold and limited war, soon our allies upon whom we depend to a very large degree will become discouraged with us as the big brother of the partnership and incline to accommodation and neutralism. We will

suffer adverse economic and political conditions arising therefrom, so that more and more we will be put at a great disadvantage at the international conference table.

Now, how far down the road that may go, I do not know.

Senator LONG. Even if our allies did become discouraged and they all pulled out on us and we were left alone, do you think this Nation would be without the will to resist or do you think this Nation would fall from internal subversion?

General TAYLOR. I think we would have to show a lot of intestinal fortitude and respond to very vigorous leadership.

Senator LONG. Is there any doubt in your mind, if that actually came about, that the Soviet could achieve that without war? Could you see us giving up without a fight?

General TAYLOR. I decline to think that would be the case, but I emphasize to you gentlemen who provide the legislative leadership that we have got to change our ways and talk the blood, sweat, and tears of Churchill in this country.

Senator LONG. What is your reaction, General White?

If the worst came to the worst and we could not count on a single ally standing by, do you think the Soviets could take this country without a fight?

General WHITE. From purely external effects, simply because all the world is Soviet? Is that what you mean?

Senator LONG. If the Soviet threatens to attack us.

General WHITE. I do not think the United States would ever cave in under those circumstances.

Senator LONG. Frankly, that is my reaction. Now, I do not say that the other things are not important. We need allies, but I do not think we would go under without them.

General WHITE. It makes our problem more difficult, of course.

DANGER OF SUBMARINE ATTACKS

Senator LONG. Gentlemen, I would like to say something here in the closeness of this room and it was, frankly, I thought, too confidential to say in the committee room 8 years ago. It seems to me as though the situation has advanced sufficiently to where it might be safe to say it now. In 1950 when I was conducting hearings on base construction in the military construction bill, a $3½ billion bill, the threat that appeared greatest to me at that time, in trying to see what was our greatest trouble, was that it looked to me as though that when the Soviets got into a position where they could strike us a sufficiently hard blow, that we would not have the capability of striking back in a way that would greatly injure them. At that time it seemed to me as though the greatest thing we had to watch out for was the danger of their getting our forward and intermediary bases by surprise, and our forward bases were within about 15 minutes of the Iron Curtain.

We did not have the capability of getting in the air that fast at that time. And it looked to me as though if they could hit by surprise and catch our forward and intermediate bases, we didn't have but about a handful of planes that could get to them and those planes were easy targets for large numbers of fast fighter planes.

A very responsible person in the Navy was at these hearings, and he came to my office and said something to this effect:

I think you are in error as to what you think is the greatest danger. You are talking in terms of what would I do if I were Joe Stalin trying to destroy the United States. I will tell you what I would do. I would use a weapon similar to what the U.S. Navy possesses now, and we have no reason to think they do not have it. I would just take some missiles that have a range of about 350 miles, and I would just put my subs in position, and at H-hour I would just fire on these bases with those atomic missiles and you wouldn't have any of the bases left. They would all be gone, and not only those in this country, but also most of the United States could be knocked out in just that way.

I began to try to see how many bases we do have that you could say would be safe from that kind of attack by a 350-mile missile. It is very few, and actually, they know pretty well what targets they are.

I just got through talking with one of your commanders, General White—and I would rather not reveal his name—and I raised this same issue with him, and he told me that the one thing he worried about while he had one of these forward bases, was that while he could defend himself from an air attack, he couldn't defend himself from a sea attack. That is the answer I was given all during that time.

Admiral Burke testified here last week that he could not give assurance that he could defend those bases. He said he might be lucky, but that his officer over there had to give him the exact answer that the Air Force officer gave me, that he could not count on defending himself from that kind of missile.

What is more, Admiral Burke said he could not see that at any time soon you were going to be in a position to defend against submarine-launched missiles.

I was told back in 1953 that we had missiles along that line. You would have to surface to fire them, but we had them. I am just curious to know where we stand on that? Are we in danger of actually getting knocked out at our forward and intermediate bases by that kind of weapon?

General WHITE. I do not think so, sir.

I am talking about strategic bases. Our forward bases are of less importance than they were. They become of less importance every day because we get a new tanker every day.

As to the bases in the United States, one of the primary missions of the Navy is antisubmarine warfare, and I believe that they can keep most, perhaps not all, submarines from our continental shores.

It is certainly something we have to depend on the Navy to do.

Senator HUMPHREY. The admiral sure didn't testify to that.

Senator LONG. That is not what Admiral Burke said. He said he could not give that assurance.

General WHITE. The continental United States?

Senator HUMPHREY. Yes.

General WHITE. I think he was referring to overseas bases.

Senator LONG. I believe you will find he was testifying on the entire problem, and he could not give that assurance.

Actually about half of your bases have a view of the sea, but the base that is most immune, the best protected, from that type of attack, I would say would be Barksdale at Shreveport. That is about as far north in Louisiana that you could get to put in a big Air Force base.

Yet it looks to me as though if a submarine surfaced off the shore, she would not need more than 350 miles range to be able to fire on Barksdale, Chenault, and Alexandria bases.

General Taylor. The Army surface-to-air missiles can knock down any cruise missiles of the type which our Navy has. Potentially, the weapons system is sufficient to cope with it if we provide a sufficient surface-to-air missile defense.

Senator Long. But you do not have it.

General Taylor. Not in all places.

General White. I just cannot believe that the U.S. Navy cannot keep submarines out of the Gulf of Mexico. It is about as simple a problem as we could be faced with.

Senator Long. I have heard talk about our testing going on in Florida and Russian submarines being right in the vicinity. I do not know whether that is true or not.

General White. But in time of tension, I would think that we would put a tail on every submarine that we know about, just as I am sure the enemy will do the same with us, if we have submarines in waters that threaten them.

You may be sure that they will put whatever kind of followup is necessary. On the high seas, there is nothing to prevent that.

Senator Long. Frankly, this is a problem about which I have been very much concerned, and have been talking about for years, because I could not see where we came near having the answer.

Now on the record the testimony that I have been able to elicit up to this moment is—and this covers over a period of 8 years—that we cannot give that assurance.

General White. I have never heard Admiral Burke make such a statement. I cannot help but think he was referring to some of the outlying bases and not bases in the continental United States. I doubt if he would guarantee that no submarines would get through.

General Taylor. That is the point.

General White. Any more than we could guarantee no aircraft could reach this country.

General Taylor. That is the point. We haven't got 100 percent protection in our whole military system.

Senator Long. A wing commander comes to the conclusion he is a sitting duck out there, and so he consults the Navy and says, "Look, wait a minute, I can defend myself in the air all right; I am not worried about my responsibilities; but how about your responsibilities?" And he never can get an answer that he is secure on that end.

The Chief of Naval Operations testifies here, "Well, no, he is not secure, and my officer couldn't have given him that assurance because we do not have what it takes to give it."

General White. I feel there must be some misunderstanding about the continental bases.

Senator Long. I am not trying to embarrass you.

General White. No, sir, you are not.

Senator Long. I have never raised this problem on the record before, but it has been bothering me now for 6 years and I think sooner or later we might as well lay it on the table. That is what the Navy was worried about 6 years ago.

Mind you, it was a very responsible person in the Navy who gave me that information 6 years ago.

General WHITE. I know that our base commander in Guam, for example, is worried about submarines, and that is a very different problem.

To a lesser degree, no doubt, the commander of the Air Force base in Puerto Rico is worried about submarines, but I cannot believe that our continental U.S. bases are subject to great dangers.

Senator LONG. How about your force in Wheelus?

General WHITE. To some degree, but the Mediterranean is a very restricted area, with complete bottlenecks at either end.

I would say that that is of less likelihood than Guam being subject to submarine attack.

General TAYLOR. Senator, in the wars I have been in the foxhole I have personally occupied has always seemed the most exposed place on earth.

Any single base, of course, could be destroyed by a surprise attack; but when you consider the great number of bases we have around the world, the opponent has no assurance of being able to neutralize all or even a majority of these bases should a general war commence.

IMPORTANCE OF MANEUVERS

Senator LONG. General Taylor, you mentioned the evaluation of Operation Sagebrush. That was conducted in a maneuver area of about 7 million acres. You are preparing to give that one up for a 2-year saving of $1,500,000, which, if projected a few years from now, would be perhaps a saving of $5 million a year.

Is it also important that you not only be able to evaluate the results of maneuvers, but that you be able to conduct the maneuvers at all?

General TAYLOR. I know you are opening the question of the matter of Fort Polk.

Senator LONG. No, sir; I am not.

As I see it, your people are willing to surrender that maneuver area as of no particular interest. The people in the area have no right to have that base opened if it cannot be justified in the national interest and, if that is the case, I would be the first to agree.

I am talking about this: Is it important, if you want to evaluate a maneuver, to conduct the maneuver in order to achieve this?

General TAYLOR. It is, but our concept of the size required is tending to change with our new tactics under the so-called pentomic structure of our units.

We are seeing that the dispersal which would be required if the enemy used atomic weapons necessitates such large areas that we are going to have to scale down our concept and be content with the testing of the various components one at a time rather than trying to do it all simultaneously.

The cost of running these maneuvers is just pricing that kind of test out of the market, and we are going to have to depend upon a maneuver of smaller units in smaller areas.

Senator LONG. Here is testimony by General Eisenhower from his book, "Crusade in Europe."

I would like you to look at the marked passages there.

General TAYLOR. I know he testified——

Senator LONG. Rather than make you read it, I can put it in the record.

Incidentally, he is referring to the maneuver he conducted in the whole State of Louisiana. He did not take a State the size of Maryland, which is the size of the area you have had in Louisiana.

I would like to read a statement or two from this book:

General Krueger himself was one of the senior officers of the Army. A private, corporal, and sergeant in the late 1890's, he had an armywide reputation as a hard-bitten soldier. But through more than 40 years of service he had kept pace with every military change, and few officers had a clearer grasp of what another war would demand of the Army; few were physically tougher or more active. Relentlessly driving himself, he had little need of driving others—they were quick to follow his example.

His Third Army was now directed to concentrate in Louisiana for a great maneuver, with Lt. Gen. Ben Lear's Second Army as its opponent.

Not one of our officers on the active list had commanded a unit as large as a division in the First World War. Like a vast laboratory experiment, the maneuvers would prove the worth of ideas, men, weapons, and equipment. More than 270,000 men—the largest Army ever gathered in the United States for a single tactical operation—were assembled by General Krueger that September. Moving out of Second Army camps at the same time were another 130,000.

The beneficial results of that great maneuver were incalculable. It accustomed the troops to mass teamwork; it speeded up the process of eliminating the unfit; it brought to the specific attention of seniors certain of the younger men who were prepared to carry out the most difficult assignments in staff and command; and it developed among responsible leaders skill in the handling of large forces in the fields.

Practical experience was gained in large-scale field supply of troops. No comparable peacetime attempt had ever been made by Americans in the road movement of food, fuel, and the ammunition from railhead and depot to a constantly shifting front line. Advance planning, consequently, was thorough and intensive; as is always the case, it paid off.

"The essential effectiveness of supply," General McNair, expert in the conduct and assessment of maneuvers, told the assembled staffs in a critique of the operations, "was an outstanding feature of the maneuvers. The magnitude of the problem alone was sufficient to warrant apprehension as to whether the troops would be supplied adequately. Combat commanders and the services alike deserve the highest praise for the results achieved." The efficiency of American trucks in the movement of troops and supply, demonstrated so magnificently 3 years later in the race across France, was forecast on the roads of Louisiana in September 1941.

In the Third Army the officer directly responsible for supply efficiency was Lt. Col. LeRoy Lutes. His brilliance in this type of work was to bring him, long before the end of this war, the three stars of a lieutenant general.

Many of the military faults revealed in the maneuvers, General McNair believed, had their root in discipline. "There is no question," he said, "that many of the weaknesses developed in these maneuvers are repeated again and again for lack of discipline. Our troops are capable of the best of discipline. If they lack it, leadership is faulty. A commander who cannot develop proper discipline must be replaced."

During this time I had my first important introduction to the press camera, which, since the days of Brady, has been a prominent feature of the American military scene. In the fall of 1941, however, flash bulbs were a fairly novel element in my daily life and I was only an unknown face to the men who used them. During the critique at Camp Polk a group shot was made of General Krueger, Maj. E. M. Bolden, a British military observer, and me; in the caption my two companions were correctly identified, but I appeared as "Lt. Col. D.D. Ersenbeing"—at least the initials were right.

The maneuvers provided me with lessons and experience that I appreciated more and more as subsequent months rolled by.

We conducted in Louisiana an extensive test of the usefulness of the cub plane for liaison and observation purposes. Its worth was demonstrated so conclusively that later, in the War Department, I was able to argue successfully, under the leadership of Assistant Secretary of War John J. McCloy, for its inclusion in the normal equipment of every division.

These planes enabled our heavy and long-range artillery to gain an accuracy and quickness of adjustment previously restricted to the light guns within eyeshot of the target; and field commanders could get a grasp of the tactical situation—

terrain, avenues of movement, concentrations of troops and artillery—almost as complete as in the 18th century, when the opposing commanders, from horseback or a hillock, could view all the regiments committed to battle.

At the end of the maneuvers I was promoted to the temporary grade of brigadier general.

The point I had in mind there is your saying that the Army is now in a position where it cannot afford to conduct any such maneuvers, not even in a much smaller area, so you would propose to limit yourselves to a maneuver area only one-tenth the size of what you now have left.

General TAYLOR. No, I would rather say that the importance of manuevers, as General Eisenhower has said, continues to be very great, but at an appropriate scale consistent with our new organization. This consideration is causing us to take a new look at the kind of maneuvers we are going to conduct in the future.

Meanwhile, the large maneuver is becoming so expensive that it is doubtful if it justifies itself.

Senator LONG. Just one further question.

Is this decision based mainly on the shortness of funds, or mainly on the future outlook?

General TAYLOR. It is really related to both. It is a question of the most efficient use of our resources in both men and money in relation to the training requirements.

We are certainly not going to do anything that in my judgment would lessen the readiness of the troops for combat. I think we can by considering the requirements of our new pentomic structure, modify our maneuvers and still obtain the benefits such as we have derived in the past.

Senator LONG. You have testified here that small wars are more of a likelihood than the big ones.

General TAYLOR. I think so.

Senator LONG. Those small wars are not always so small, are they? Sometimes they get down to being wars between 20 and 30 divisions, don't they?

General TAYLOR. Korea was a limited war but it took 624 division-months of combat to achieve the stalemate which now exists.

Senator LONG. And how many divisions did you have at the time you were fighting at full scale in Korea?

General TAYLOR. We had 24 division-equivalents, including United States, Korea, and allied, almost a million men.

Senator LONG. Is General Eisenhower substantially correct in saying that you can never really guess what all your problems are going to be until you have actually gone through the motions to get some idea as to what you are up against?

General TAYLOR. That is right. That is why you must have maneuvers.

Senator LONG. Thank you very much.

BAN ON PRODUCTION OF NUCLEAR MATERIALS

Senator HUMPHREY. Has the Army or the Air Force ever made specific requests for the development and production of small nuclear warheads which have been rejected?

General TAYLOR. No.

General WHITE. No, sir.

Senator HUMPHREY. I have just reread your testimony, General Taylor, on a ban on the production of nuclear materials.

You know that our Government's position at the London Conference of a year ago, was that we should seek not only a ban on tests, but that it should be coupled with a ban on the production of nuclear materials.

General TAYLOR. But related to a prior agreement on inspection.

Senator HUMPHREY. Yes. But what I mean is that they were to be intertwined.

In other words, we proposed a ban on testing, with inspection, and a ban on the production of nuclear materials.

I realize that your statement indicates that there are some political decisions made here that have superiority, but the body of the record of your testimony, as I read it, would seem to indicate—and I think a fair-minded evaluation of it, would show—that if we were to stop production of fissionable materials, it would seriously impair our weapons efficiency. Is that right?

General TAYLOR. Yes, that is true.

Senator HUMPHREY. That has nothing to do with inspection.

You said:

> A banning of the production of nuclear materials for weapons purposes would preclude any increase in the current stockpile now available for military use.
>
> Not only would it be impossible to increase the size of our weapons stockpile, but its composition would be frozen except for such modification of existing weapons as might be possible through a costly and time-consuming remanufacturing process.

Then you went on to say:

> As you know, production of tactical nuclear weapons and provision of warheads for new weapons systems such as the antimissile missile will require additional fissionable material.
>
> Reworking and redistributing the fissionable material now incorporated in stockpile weapons might appear to be a measure to alleviate the need for new material. In my opinion, however, it would provide only a partial solution.

So what you are saying is that if such a ban went into effect, it would handicap us considerably. Is that right?

General TAYLOR. Yes. I have been pointing out the military objections or hazards without considering, of course, any compensating gains in other fields, such as political, and so on.

LIMITATIONS ON ADEQUACY OF OUR MILITARY STRENGTH

Senator HUMPHREY. That is a very candid statement. It is prepared very carefully. It is prepared to support the military necessities and the military requirements, and that is your obligation.

Then, of course, you noted the importance of the political decisions. But then we come to the question of the adequacy of our strength, and the thing that I wish to point out is this: My point of view is that there isn't the same kind of preciseness in pointing out the limitations on our strength as there is the preciseness in pointing out the limitations as a result of banning tests or the production or cutoff of fissonable materials.

BASES

Take, for example, these bases that General White spoke about that ring the Soviet Union. Both of you have spoken about the

fact that the Soviet Union is ringed with bases, which has been a measure of our security.

Yet neither of you mentioned the question of the adequacy of the Soviet bomber fleet to attack those bases. I am not talking about their intercontinental ballistic missiles. But how many of our Strategic Air Command, General White, are based on foreign bases within, let's say, a thousand miles of the Soviet Union?

General WHITE. Those, I think, within the United Kingdom are within a thousand miles of the Soviet Union.

Senator HUMPHREY. Do you have any around the Turkish area?

General WHITE. No strategic bombers.

Senator HUMPHREY. The only strategic bombers you have are in Great Britain.

General WHITE. The only ones that are within a thousand miles. We have them in Spain, we have them in north Africa.

Senator HUMPHREY. How far are those in north Africa from the Soviet Union?

General WHITE. I think they are better than 1,500 miles.

Senator HUMPHREY. Those in Spain?

General WHITE. About the same, I believe.

Senator HUMPHREY. What is the percentage of your total Strategic Air Command that is within the flight distance of a medium-range bomber, of which the Soviet has plenty?

General WHITE. The same numbers I have mentioned. In percentage, I would have to do some computations.

Senator HUMPHREY. Roughly.

General WHITE. About a fifth, I should think.

Senator HUMPHREY. Just about a fifth. In other words, four-fifths are within the United States——

General WHITE. Or in Guam, in the Far East, in the north.

Senator HUMPHREY. My point is that while we are always concerned about whether the Soviet has these intercontinental missiles and what they could do to us, that presently our weakness in missiles is compensated for, according to official testimony, by the bases that ring the Soviet Union and by our own long-range bombers that are largely based within our own hemisphere.

General TAYLOR. To include the Tactical Air in Europe. They are all capable of carrying atomic weapons, as are also the airplanes of our allies.

Senator HUMPHREY. The Tactical Air and the airplanes of our allies are all within the scope of Soviet attack possibilities.

General TAYLOR. Yes, sir.

Senator HUMPHREY. I mean attack from their long-range bombers or their intermediate-range bombers.

Gentlemen, the only thing I am saying is that sometimes we paint in precision and detail the picture of our capabilities—just as you have pointed out—and what the limitations and the weaknesses are with respect to a cutoff of the production of fissionable materials, or with reference to what the test ban would mean to you. But I must say that I have a feeling—and this is just my personal feeling—that the same degree of precision as to the weaknesses of our defense posture, particularly relating to Soviet airpower coupled with ICBM's, just wasn't there.

General WHITE. My calculations were in error by about a hundred percent. It is something less than a tenth of the strategic capability.

Senator HUMPHREY. Something less than a tenth. Then why are we arguing about these bases all the time?

General WHITE. You mean why are they valuable?

Senator HUMPHREY. Yes.

General WHITE. Because the units that are there are all on very quick reaction alert, the entire number.

SOVIET MILITARY STRENGTH

Senator LONG. I am satisfied of this. If these people get ready to strike us, they are going to try to get your planes on the ground. You know that, too. And they are going to make every effort they can to keep you from knowing you are being attacked. Also, I suspect that at the time you try to strike back, if their attack has been a surprise one, they are going to tell all their people to head for dug-in bomb shelters. They are going to have as many survival shelters as they can construct which will be ready at the time they strike, and when you go to strike back, they are going to have swarms of fighter aircraft after you and they are going to have a lot of good missiles.

Now I flew over the Soviet Union in Soviet planes, and I noticed this. I would be flying somewhere, and I couldn't find out where I was. I took a map along so I could look down at the ground and perhaps be able to come back and report something to you, and I couldn't identify where I was.

Well, we asked the guide if a certain town was Tula. He said, "No, that couldn't be Tula." Actually, of course, you know these Soviets lie to you. They won't refuse to answer the question; they just lie to you. They tell you something that they know is wrong.

But Tula had to be on one side of the river and they would say we were flying on the opposite side so it couldn't be Tula, so I got confused as to just what this town was. The tourist guide was briefed to tell you the answer as far as he was concerned, but he didn't know what to say. He was confused and had no idea about it, and he didn't see why it was classified because they make their points not to fly over military targets, I believe. They go way south and turn up to approach cities, and things of that sort. Well, he said, "Wait a minute, I'll get the pilot and he will help find it."

The pilot came back and he hadn't been instructed at all. He was just flying the airplane. So we took out our map and showed him the map and asked, "Please point out where we are." He looked at it and of course it had Latvia, Lithuania, and Estonia on there, and he said, "This is a very old map," and then he said, "Wait a minute, you will never find it this way." He went out and brought in his map and on his map between Moscow and Kharkov, he had two lines. One was a straight line, and the other was a dogleg course.

Now, I do not know what that would mean to anybody else, but to me it means this: When they are flying by day, they fly the dog-leg course, and by night, they fly the direct route, so if they have tourists and guests aboard that plane to look out the window, they do not fly the direct route, but the dog-leg route. And he showed me where we were on the dog-leg course, which was way out of our way.

We didn't stop in between. It was just a circuitous route of getting there.

One thing I did notice was that every time we approached Moscow, whether it was from the north, south, east, or west, or in leaving or coming in, you could always look down and see a great big installation of runways running in all directions in an odd pattern, and the nearest we could make out of it was that it was a tremendous missile launching site, but I do not think it would be an ICBM site. That would not have to be near Moscow.

Now, the point I have in mind is that that is the type of thing they would like to fly you around so you wouldn't see it, but they couldn't get you to Moscow without flying you over one, so the result was they just flew you on over. At a time when you would have to get ready to take your bombers to Moscow, you had better be set for this because they have got plenty of missile sites there.

Just how good are those B–47's that you are relying upon to get in as against fast fighter planes and against those missiles?

General WHITE. The B–47's are approaching obsolescence. Their tactics are what are going to enable those aircraft to go through. You might have a force of B–47's that would have nothing but electronic countermeasures, and the force behind them would have the bombs. Our aircraft have detection devices for picking up enemy radar signals and some aircraft will bomb the radar. Behind them could come the B–52's. Some will be high, some low, some coming from this direction, some from that direction. When we have the ICBM's, I can imagine they will certainly be the first ones in. They will blast their way in. Some aircraft will have the Quail aboard, which is a radar-spoofing missile itself.

The B–52's will have the Hound Dog on some of them, which they will fire 400 miles from the target.

Senator LONG. What percentage of your attack bombers would be B–47's, if you had to fight now?

General WHITE. About three-fourths at the present moment are B–47's.

Senator LONG. That plane is approaching obsolescence, you say.

Here is the point I have in mind: You mentioned something about projecting ahead. You are not in very good shape if you say "Right now it will be fine," but 2 years from now the situation won't be good at all.

General WHITE. Our plans call for, and we do now have, production that will bring in additional B–52's and B–58's and for each wing of additional B–52's we get, we take out two wings of B–47's and we take out two wings of B–47's for each B–58 wing that comes in.

Senator LONG. Why do you take out two for one?

General WHITE. Because the new aircraft are much more effective than the old ones.

Senator LONG. Twice as effective?

General WHITE. On the order, perhaps. At least we are willing to accept that as we are phasing in the missiles, too.

Senator LONG. How about the other fellow? Is he standing still, or improving his defenses?

General WHITE. The other fellow is apparently doing the same thing.

Senator LONG. Cutting the number of his planes in half?

General WHITE. He is producing his B–47's today where we haven't produced any for several years. But his Bison or the heavy bomber

production has not gone up to the degree that we thought it would. He is producing them, but in lesser numbers.

Senator HUMPHREY. You mean his long-range bombers?

General WHITE. His long-range bombers.

Senator HUMPHREY. That is right. He is producing the short-range bombers and they are pretty good, aren't they, General?

General WHITE. Yes

TAKING ADVANTAGE OF ARMS CUTS

Senator LONG. Might I suggest just one more thing? Disarmament is our primary responsibility here. Senator Humphrey mentioned propaganda value. So far nobody has done much disarming except us. We have disarmed with budgetary cuts. What little disarmament the Russians have done they have propagandized to the skies.

General WHITE. We have cut from 137 wings to 102 wings and we should have taken advantage of that.

Senator HUMPHREY. And there aren't 1,000 people outside of the United States who know about it.

Senator LONG. If our people are getting ready to make one of these cuts, if it has to be done, why not let us know ahead of time? Why couldn't this administration start saying let's disarm, let's get together, let's see what we have we can both cut?

The truth of the matter is I do not think we can afford to make our situation any worse vis-a-vis the Russians than it is now, but at the same time, if we are going to cut, why should we not take advantage of it?

In cutting back, let's do what they did to us when they made all that talk about disarming. I think they had already decided they had to do some disarming, that they would have to cut the size of their Army, and then they cut it.

General TAYLOR. I do not think we have any blue chips left to put on the table.

Senator LONG. But if you want to bargain, isn't it a good idea to try to get some blue chips to bargain with?

MILITARY PAY SCALE OF UNITED STATES AND SOVIET UNION

Senator LAUSCHE. What is the relative pay of the rank and file soldier of the Soviet Union and of the United States?

General TAYLOR. There is a very great disparity.

Senator LAUSCHE. You cannot give it? The other day it was said it was 10 to 1.

General TAYLOR. I am not sure.

Senator LAUSCHE. That is, if we get $10, they get $1.

General TAYLOR. I believe that may be correct.

(The Defense Department subsequently furnished the following information for the record:)

The table below sets forth the annual basic pay of comparative enlisted ranks in the Russian and U.S. Armies. Both scales are subject to increase as the enlisted member accrues additional longevity. In addition, certain allowances

are paid when applicable, such as the family allowances which are paid both to U.S. personnel and Russian personnel.

Grade	U.S.S.R.[1]			U.S.A.[2]	
	Annual conscript pay		Annual pay of professional enlisted man	Grade	Annual pay
	1st and 2d year	3d year			
Starshina (master sergeant or 1st sergeant)	$180	$360	$840	E-9	$4,560
				E-8	3,720
Senior sergeant	120	240	720	E-7	2,832
Sergeant	90	180	600	E-6	2,400
Junior sergeant	72	144	480	E-5	2,160
Corporal	48	84	360	E-4	1,800
				E-3	1,192
Private	36	60		E-2	1,030
				E-1	998

[1] Dollar equivalent of rubles, converted at actual consumer value rate of 10 to 1. Legal exchange rate is 4 to 1.
[2] E-1, E-2, E-3, under 2 years' service; E-4, E-5, E-6, E-7, over 2 years' service; E-8 over 8 years' service; and E-9 over 10 years' service.

RELATIVE MILITARY STRENGTH OF THE UNITED STATES AND SOVIET UNION

Senator LAUSCHE. Assuming that the Soviet excels us in the ICBM, that it equals or excels us in the intermediate missiles, and that it is definitely superior to us in the submarines, does our military strength have a power so great as to neutralize this superiority?

General TAYLOR. I should say, Senator, that you would have to look at all our forces function by function and decide whether they are adequate or not.

The first functional force is one we have been talking about, our air atomic deterrent force, which is essentially based on the manned bomber today. That force is sufficient in my judgment as of this moment.

We have to get into the long-range ballistic missile business as we go down the road, but for the time being, in combination, I would say our atomic deterrent force is all right. You have to look then at the air-defense picture which is related to our striking force. Do we have enough of that? Do we have reasonable assurance of protecting the hard core of our vital areas here in the United States?

We have to look at our limited war capability. Is that enough, because as I say, the danger of being nibbled to death is always with us. So the only way I know to answer your question is not in a simple sentence, but rather taking our forces category by category, looking at what we have and what the requirement might be, and then asking ourselves, is that enough? I would say, as a rather general answer, I think we have enough in certain categories and not enough in others.

Senator LAUSCHE. Is it your conclusion, then, that the sum total of the advantages and the sum total of the disadvantages, compared with those of the Soviet bloc, puts us in a superior position?

General TAYLOR. It is hardly a superior position to say we can deter the other fellow from initiating a general war because we are deterred also to a large degree. But I say I have no doubt as to the adequacy of our overall general war deterrent capability as of now, but it has to be watched.

Senator HUMPHREY. A very fine friend of mine, a very prominent American, called me a while ago and he said, "I am worried." He called me at 7:30 in the morning, so he must have been worried.

He said, "I am tired of hearing that we have equal strength with the Soviet Union. I am tired of hearing that we have strength enough to deter them. We are not going to start any war. The deal is that if there is one, they will start it, and if they start it, the initial impact gives them an advantage. Therefore, for us to talk about being equal is for us to talk about being behind."

This fellow, surprisingly to me, as I didn't know he thought about these things, said to me, "When are we going to have people around here who can assure us that we not only have strength equal to theirs, but that we are far superior, so that we can lose a fourth, and still be equal?"

Senator LAUSCHE. Senator Humphrey, that is the position that I take. I want to resolve every doubt in favor of giving to you men whatever money you need to be able to say that we are superior and that we will deter.

NEGOTIATING DISARMAMENT FROM A POSITION OF STRENGTH

Senator HUMPHREY. Our feeling on this committee has never been that we were approaching the position where any substantial disarmament agreement was necessarily in the offing. We have attempted through these hearings to encourage the responsible officials to develop inspection, detection, and identification, the whole theory being that any kind of an agreement, unless it is mutually advantageous, is not going to be lived up to or made.

If you make an agreement, you must have built-in protections, so that there are no violations. And as one of your distinguished predecessors, Admiral Radford, said, we must build an alternative for trust, and the inspection and detection system is the alternative, and this is what we keep pushing. That is why I asked you if you had a group of technicians working on this matter. Are our technicians spending enough time working on these many problems that Mr. Foster's group came up with as a result of the surprise attack conference. He did find out a great deal, and the documents that he has brought back, the documents that were published, show that a tremendous amount needs to be done before we can really even enter into any such agreement with any degree of safety at all.

We found this out at the Geneva Conference last summer on the detection of nuclear tests.

We have to know a great deal about the inspection and detection system. The Hardtack series in October proved again the need of even greater emphasis. So our subcommittee works on the basis of encouraging public awareness of the importance of the things you have emphasized here—of detection and inspection, a system of controls. This is what we are attempting to do.

The final thing is this: The reason I think it is important that we ask these questions about military strength is because you will never get anyplace in trying to negotiate with the Soviet Union, unless you have such power that it is clearly demonstrable beyond a shadow of a doubt.

As a matter of fact, if we do not have adequate power, we will start bargaining away something that we ought not to have even thought

about bargaining. You have to have enough strength at the start so that whatever compromises are made, you haven't bargained away your security. This is my view about it. I think that is also the general view of the Disarmament Committee.

BERLIN SITUATION

Senator LONG. Here is a question that occurs to me about this matter. It seems to me that there are a number of situations that are likely to arise where the Soviet can seek military solutions. Berlin is the easiest example.

Now our people say if they are going to cut us off from Berlin, we are not going to take it lying down but that we will try to move through, that we will send a tank division through to Berlin. But once a military solution to this question becomes necessary, we don't have the conventional forces to follow through with it. Suppose they do seek a military solution to Berlin or a military solution without provoking it immediately, just a step-by-step approach so that there is never a particular point where you can justify yourself in resorting to atomic warfare.

How do we handle that if we do not have the conventional forces to match their conventional forces?

General TAYLOR. We have all the strength that is necessary if we are willing to mobilize it and do so in time.

Senator LONG. Mobilize the entire Nation, you mean?

General TAYLOR. Yes. You cannot play around in this business unless you have a lot of blue chips in your pocket. This is unlimited poker.

Senator LONG. But I heard you make the statement a moment ago that as it stands right now on disarmament, you do not have any blue chips to give away?

General TAYLOR. We do not with standing forces, to give away. We have a mobilization base, in proved reserve forces, and so on.

Senator HUMPHREY. Thank you very very much, gentlemen.

(Whereupon, at 12:55 p.m., a recess was taken until 2 p.m. this same day.)

AFTERNOON SESSION

Present: Senators Humphrey (chairman) and Wiley of the subcommittee, and Senator Carlson.

INTRODUCTION OF DR. HANS BETHE

Senator HUMPHREY. Our first witness is Dr. Hans Bethe, a member of the President's Science Advisory Committee and professor of physics at Cornell University.

Dr. Bethe is an outstanding scientist in the nuclear field and has followed closely developments related to the detection of nuclear weapons tests. He also appeared before the subcommittee on April 17, 1958, to discuss the implications of a suspension of nuclear weapons tests and the kind of inspection system necessary to accompany such a suspension. I have asked Dr. Bethe to give us his views on what the new data obtained from the underground tests in Nevada last fall, the Hardtack series, mean in terms of the inspection system discussed in the report of the Geneva Conference of Experts.

I might add, Dr. Bethe, that we would welcome your personal evaluation of the inspection system that was proposed at that Geneva Conference last summer, and your judgement on whether or not the new data unduly complicate the proposed inspection system.

Senator CARLSON. Mr. Chairman, before Dr. Bethe proceeds, may I state that Kansas has been proud to have furnished the chancellor of Cornell University. Chancellor Deane Malott is from our State. We are very happy to say that he is from our State.

Senator WILEY. Dr. Bethe, I am glad to see you again. I am looking forward to being enlightened by your ideas. I trust that you will start off by defining "tests" in a scientific sense.

STATEMENT OF DR. HANS BETHE, MEMBER, PRESIDENT'S SCIENCE ADVISORY COMMITTEE AND PROFESSOR OF PHYSICS AT CORNELL UNIVERSITY

Dr. BETHE. Well, your chairman, Senator Humphrey, has given a talk on the floor of the Senate in which he has already given a very balanced picture of the situation in the seismic detection of underground tests.

In short, there have been exaggerations on both sides. I have here the article in Pravda which you referred to in a previous meeting, and which purports to say that nothing has changed, and that the new data are not genuine, and this statement of Pravda is incorrect.

I have also seen statements in the United States press which sound as if the world were coming to an end, and as if the Hardtack II results were an indication that we could not detect underground explosions at all, or not satisfactorily.

Well, this is likewise an exaggeration on the other side, and I will try to say what actually has happened.

As you know, we had only one test explosion before we went into the Geneva Conference last summer, and so our data were rather——

Senator WILEY. Were you there?

Dr. BETHE. I was at the Geneva Conference part of the time, not all the time, but about a third of the time. So I know in general terms about the discussions.

We have now several more underground test explosions, and the most important of these are the 5-kiloton and the 20-kiloton explosions which took place this October—last October.

RESULTS OF HARDTACK II EXPLOSIONS

The first result from these explosions was that the signals generally were only about two-thirds of what had been expected.

Senator HUMPHREY. That is the magnitude?

Dr. BETHE. The magnitude of the signal.

Senator HUMPHREY. Was about two-thirds?

Dr. BETHE. Was about two-thirds of what had been expected on the basis of the previous Rainier shot.

These were part of the AEC test series in Nevada, which were meant for weapons development, and incidentally, they were carried out underground to prove that one could carry out tests underground and prove this better, and still incidentally, elaborate measurements were made with seismic stations all around the country to find out

the magnitude of these tests, the magnitude of the seismic signal. And you may remember when I had the honor of testifying to you in April, we discussed at some length the desirability of getting more information.

Senator HUMPHREY. Yes, sir.

Dr. BETHE. And, in my opinion, it was very important to get more information, and it still is important to get still more information.

That does not mean that one must remain inactive in the absence of more information, but we have to push, I think, for further underground tests either by ourselves or international tests under international auspices, which would teach us more closely just what you can do in the way of test detection.

DATA ON SHADOW ZONE

Now, these two tests, as I mentioned, were observed not only at the normal seismic stations which we have in this country, but some stations were specially set up for the purpose of detecting the signal. And, as Dr. Romney has already told you, the results from the special stations were in general agreement with the results from the permanent stations.

There was one result which was surprisingly favorable, namely, it was possible to see the signal, to perceive the seismic signal in the so-called shadow region.

It is known from earthquakes that, at distances between 600 and about 1,400 miles, the seismic signal is very weak and quite anomalous, and this was taken into account by the Conference of Experts last summer in Geneva. The Conference of Experts decided not to pay any attention to signals received in this intervening region, in this shadow zone, but to rely entirely on signals received at stations within 600 miles, which is called the first zone, and stations beyond 1,400 miles, which is called the second zone of detection.

Now, it turned out in the October tests that there were signals even in the shadow zone. They could be useful to detect explosions. They are, however, quite useless to identify an explosion, that is, you cannot, by means of these signals, distinguish an explosion from an earthquake.

Senator HUMPHREY. That is the shadow zone area, from 600 to 1,400 miles?

Dr. BETHE. Right.

Senator HUMPHREY. So to get this perfectly clear, the first zone is from zero to 600 miles?

Dr. BETHE. Right.

Senator HUMPHREY. In which the signal——

Dr. BETHE. Is strong.

Senator HUMPHREY. The shadow zone, as it has been estimated, is from 600 to 1,400 miles, in which the signal is fuzzy, unclear, or of less magnitude than required.

Dr. BETHE. Yes.

Senator HUMPHREY. And that zone was agreed upon as not being controlling for purposes of detection or identification.

Dr. BETHE. That is right.

Senator HUMPHREY. Then the zone starting from 1,400 miles out is the second zone.

Dr. BETHE. That is right.

Senator HUMPHREY. Now, the Hardtack series revealed that in the zone from 600 to 1,400 miles some faint signals were obtained that improved the possibilities of detection.

Dr. BETHE. Yes.

Senator HUMPHREY. But it also showed they were not reliable for identification.

Dr. BETHE. That is correct.

Senator HUMPHREY. But isn't it also true that the experts agreed before the Hardtack series that the 600 to 1,400 mile zone was not to be considered as capable of furnishing controlling evidence?

Dr. BETHE. It was not to be considered at all.

Senator WILEY. What were the sizes of the test explosions?

Dr. BETHE. One was 5 kilotons, and the other was 20 kilotons.

Senator WILEY. Well, if the shock from the explosions was less, did this affect the 600 to 1,400 mile zone?

SIZE OF SIGNALS IN VARIOUS ZONES

Dr. BETHE. That shadow zone is present no matter what size the explosion is. The signal in the first and second zone becomes smaller if the explosion is smaller. But the existence of the shadow zone and the width of the shadow zone, namely, 600 to 1,400 miles, is the same whatever the size of the explosion. This is just a property of the structure of the earth.

Senator WILEY. If the explosion is only 1 kiloton?

Dr. BETHE. If it is 1 kiloton, that shadow zone is the same; if it is 1 kiloton, however, it will give a very small signal in the second zone.

Senator HUMPHREY. Beyond 1,400 miles?

Dr. BETHE. Beyond 1,400 miles.

Senator WILEY. If it is in the area of the shadow zone, then you are not in a position to tell whether it is an earthquake or an explosion?

Dr. BETHE. Not at all.

Senator HUMPHREY. And it doesn't make any difference what size the explosion is?

Dr. BETHE. It doesn't make any difference.

Senator HUMPHREY. But the size of the explosion will be registered in the first zone and in the second zone?

Dr. BETHE. In the first zone and the second zone, that is, at less than 600 miles and beyond 1,400 miles. And the Geneva system of stations has, of course, stations all over the world, so some of these stations will be in the first zone, some will be in the shadow zone, and therefore useless, and some will be in the second zone, and again useful.

Do I make myself clear?

Senator HUMPHREY. Yes.

Senator WILEY. What is the instrument that detects the explosion?

Dr. BETHE. A seismograph.

Senator WILEY. Since this is an age of advancement, can't you improve the instrument?

Dr. BETHE. You can improve the instrument, but nothing you can do will make the shadow zone very useful. Improving the instrument is very useful for improving the signal in the so-called second zone at 1,400 miles or more, and therefore, improving the instrument is indeed exactly the line we should follow.

DEGREE OF REGISTRATION IN EACH ZONE

Senator HUMPHREY. In other words, Doctor, here is the point of explosion, the center of this block, and 600 miles out is the end of the first zone.

Dr. BETHE. Yes.

Senator HUMPHREY. Anywhere in between zero and 600 miles that you put seismographs you are going to get a record of the explosion.

Dr. BETHE. Yes, and a good one.

Senator HUMPHREY. If it is a 1-kiloton explosion, it would be a light record.

Dr. BETHE. In this zone, even a 1-kiloton explosion registers very strongly.

Senator HUMPHREY. But the degree of registration will be related directly to the size of the explosion?

Dr. BETHE. Certainly.

Senator HUMPHREY. Now, beyond 600 miles, from 600 to 1,400 miles is a shadow zone in which for purposes of detection and identification the peculiarities of the earth prevent the acquisition of any data that can be relied upon.

Dr. BETHE. That is correct.

Senator HUMPHREY. It doesn't make any difference what you do about it, that is just a fact?

Dr. BETHE. That is just the fact.

Senator HUMPHREY. Now, beyond 1,400 miles out here you can have more seismographs——

Dr. BETHE. That is right.

Senator HUMPHREY. And they will register the magnitude of the explosion on the seismograph. In other words, the tracing on the seismograph will be as vivid as the size of the explosion?

Dr. BETHE. That is precisely it.

Senator WILEY. What kind of explosions were they?

Dr. BETHE. Well, these are nuclear weapons which are exploded.

PURPOSE OF NUCLEAR TEST EXPLOSIONS

Senator WILEY. I want to know what the real purpose of these nuclear explosions is. Is it to get certain information?

Dr. BETHE. That is correct.

Senator WILEY. Well, tell us about that.

Dr. BETHE. Well, we have used nuclear test explosions to improve our knowledge on the design of nuclear weapons. We have done this very effectively, and so have the Russians. [Deleted.]

Each new explosion gives us a little more information about the design of some particular class of weapons.

Senator WILEY. I see.

Senator HUMPHREY. Each new explosion helps develop some new weapon.

Senator WILEY. Does a 20-kiloton explosion give you more information than a 1-kiloton explosion?

Dr. BETHE. No; it gives us different information.

Senator WILEY. In what way?

Dr. BETHE. It gives us information about a bigger weapon, and the 1-kiloton gives us information about the smaller weapon.

Now, the smaller weapons are used for air defense, for instance, and they might be used in the field by the Army for close support of troops.

If you have 20 kilotons, this is what we normally call a tactical weapon. It may be used, for instance, to destroy a small air field or some enemy troops, troop concentration, and then you have the various yields which are used as warheads for our missiles, and the thousands of kilotons which could be used for strategic bombing.

EFFECT OF NEW DATA ON GENEVA CONCLUSIONS

Senator HUMPHREY. What Dr. Bethe is attempting to help us with today, is the effect of the new data upon the conclusions drawn by the Geneva Conference of Experts.

Dr. BETHE. That is what I hope to say.

Senator HUMPHREY. As you know some people said that the new data necessitated a complete reevaluation of what had taken place at Geneva last summer. They have said that the conclusions last summer have been made invalid because of the new explosions, since the conclusions last summer at Geneva were based pretty much on the Rainier test, plus the theoretical knowledge we had, plus the knowledge about earthquakes and nonnuclear explosions.

Dr. BETHE. Yes.

Senator HUMPHREY. But with these four new nuclear explosions last October, new data were obtained, and some people have said that the new data literally washed out all that had been accepted as true before.

What Dr. Bethe is saying is that the new data didn't affect the first zone or the second zone, but it did show up a few tracings in the shadow zone.

Is that right?

Dr. BETHE. That is correct, except that I said that the magnitude of the signal in the first and second zone was less than——

Senator HUMPHREY. Than they had anticipated.

Dr. BETHE. Than they had anticipated.

Senator HUMPHREY. In other words, the larger explosions theoretically should have yielded a larger magnitude in the first zone and the second zone.

Dr. BETHE. That is correct.

Senator HUMPHREY. But they did not. In other words, the practical experience did not fully substantiate the theoretical conclusions.

Dr. BETHE. That is correct.

Senator HUMPHREY. However, the practical experience did not destroy the theoretical evaluations.

Dr. BETHE. That is also correct.

Senator HUMPHREY. It only turned out to be a little less.

Dr. BETHE. That is correct.

Senator HUMPHREY. In other words, the assumptions were greater than the fact.

Dr. BETHE. That is correct.

SIZE OF RAINIER TEST EXPLOSION

Senator WILEY. Well, how big was the first test explosion?

Senator HUMPHREY. The Rainier test explosion?

Dr. BETHE. The Rainier was 1.7 kilotons.

Senator WILEY. 1.7, and the others were 5 and 20?

Dr. BETHE. Approximately; it is not accurately known, because it is quite difficult to determine accurately the yield, the energy release, of a nuclear explosion conducted underground, and this is still being studied by the scientists at Livermore, just how exactly to determine that yield.

So 5 and 20 are approximate figures, and they may be wrong by a few percent up and down.

Senator WILEY. What I am getting at now is the matter of the shadow zone between 600 miles and 1,400 miles.

Dr. BETHE. Yes.

Senator WILEY. Did we get anywhere in Geneva as to any agreement on this point?

Dr. BETHE. Last summer, or now?

Senator WILEY. Both.

GENEVA AGREEMENT ON DETECTION SYSTEM

Dr. BETHE. Well, last summer we concluded an agreement, if you wish; that is, we came to certain conclusions rather than to an agreement, we came to certain conclusions concerning the needs of a detection system, concerning the kind of equipment which would be necessary for detection stations.

Senator WILEY. You got what Roosevelt used to call an "if" agreement?

Dr. BETHE. That is correct.

Senator WILEY. And you have never yet agreed to apply the Geneva conclusions?

Dr. BETHE. Now, at the moment there are diplomatic negotiations, and those are very difficult and progress very, very slowly, to determine the political setup of a control organization which would monitor the test cessation, if such a test cessation were to come into effect. That is, we are negotiating simultaneously a test cessation and the monitoring system.

SPACING OF STATIONS IN GENEVA SYSTEM

Senator WILEY. We would have to put, on the basis of 600 miles, how many stations all over the world?

Dr. BETHE. Well, the Geneva system provides in seismic regions of the earth stations every 600 miles, and that means that in general, if you have an explosion occurring anywhere in the world in a seismic region, there would, in general, be at least three stations which would pick up the signal, the strong signal of the first zone. There would be many other stations in the second zone which would also pick it up, if the explosion is strong enough.

Senator WILEY. If I understood your answer right, all over the land area of the world you would have to have stations which would not be over 600 miles apart; is that right?

Dr. BETHE. All over the area in which earthquakes normally occur. There are certain areas of the globe where earthquakes are extremely rare. For instance, in Washington, and over most of the Soviet Union, the same is the case. It is only the eastern border of Siberia,

and a little bit of the southern border which has frequent earthquakes, and likewise, in this country, only California has frequent earthquakes, so the experts agreed that the 600-mile net should be put up in all areas in which earthquakes are frequent. But in the areas in which earthquakes occur very seldom, a wider net of about 1,100 miles would be sufficient.

Senator WILEY. But you never got to a basis of agreement on that?

Dr. BETHE. On this we have agreed.

Senator WILEY. You mean, to install such a system?

Dr. BETHE. We agreed in the summer that this would be the necessary net to provide a good detection system.

Senator HUMPHREY. Now it is up to the diplomats to negotiate the installations?

Dr. BETHE. That is right, the installations; and we are not satisfied just with the installations, but we require, in addition, there be a good political setup, no veto, that in the Russian stations we should have western scientists who take the observations rather than Russian scientists, and matters like these, and this is what we are at the moment negotiating.

NUCLEAR TESTS FOR PEACEFUL PURPOSES

Senator HUMPHREY. Dr. Bethe, one of the arguments between the Soviet Union and the United States and the United Kingdom at Geneva has been over tests for peaceful purposes. In other words, our position paper at Geneva included that there should be a number of tests under international supervision for the purpose of peaceful development of atomic energy.

Dr. BETHE. I know.

Senator HUMPHREY. And also to improve detection.

Dr. BETHE. Yes.

Senator HUMPHREY. This general suggestion of peaceful explosions for advanced research on detection was included in our experts' agreement, or at least a provision for more research to improve detection?

Dr. BETHE. In the experts' agreement?

Senator HUMPHREY. Yes.

Dr. BETHE. We did not include any.

Senator HUMPHREY. No peaceful tests?

Dr. BETHE. Neither peaceful tests nor tests to determine the capability of the system.

Senator HUMPHREY. No. But you did include provisions for advanced research in test detection?

Dr. BETHE. Yes.

RUSSIAN AGREEMENT TO TESTS FOR PEACEFUL PURPOSES

Senator HUMPHREY. What I am getting at is that the Russians have objected vigorously to any of these peaceful tests up until recently. Within the last couple of days the Russians have agreed to the principle that further tests for peaceful purposes designed to aid research would be acceptable.

Dr. BETHE. I did not know this.

Senator HUMPHREY. I talked to Khrushchev about this at length.

Dr. BETHE. Yes.

Senator HUMPHREY. I tried to point out this was the only way that I thought we could ever have a system that would advance, develop, and grow. Otherwise you would be dealing with theory and uncertainties.

Dr. BETHE. Very good. Now, I am very glad to know that the Russians have agreed to this in principle. They were originally very much against any kind of tests, including peaceful tests. We were hopeful in the present meeting that they would finally agree to peaceful tests, because they always talk about nuclear weapons tests. They never talk about nuclear explosions, and so we thought that they were preparing the way for agreeing to peaceful tests.

Senator HUMPHREY. Yes.

THE PLOWSHARE PROJECT

Dr. BETHE. Now, the peaceful tests are, of course, of two kinds: One kind is to—is what is called the Plowshare project by the AEC. You undoubtedly are aware of this, namely, the application of nuclear explosions for the purpose of certain peaceful accomplishments, for instance, making harbors or crushing the earth so that oil comes out more easily, or that mining operations are facilitated.

This is one kind of peaceful tests, and we were very anxious that such tests be allowed in our agreement, and I am happy to hear that the Russians now are willing to have this inclusion.

Senator HUMPHREY. They have accepted this in principle.

Dr. BETHE. In principle.

Senator HUMPHREY. Of course, you still have to negotiate the numbers and the mechanism.

Dr. BETHE. And the mechanism, and it is important to see to it that these peaceful tests not be misused for weapons development.

Senator HUMPHREY. That is right.

Dr. BETHE. And I think this is just as important for us as it is for the Russians, that there be proper safeguards.

Senator HUMPHREY. Right.

Dr. BETHE. And I think we have a set of proper safeguards worked out which we can present to the Russians.

Senator WILEY. Yesterday in one of the Sunday magazines there was a big spread on the utilization of nuclear explosions for peaceful ends.

I also saw in the newspaper that some prominent scientist, possibly Dr. Teller, said that we hadn't the ability or the system or the technique to detect underground tests.

Senator HUMPHREY. I think that is Dr. Teller's position.

Dr. BETHE. This is what I want to testify to, if you will permit me.

Senator HUMPHREY. Good.

RESULT OF OCTOBER TESTS REGARDING FIRST MOTION

Dr. BETHE. This is what I want to testify to, just this problem.

The main result of the October test in Nevada was not what I said before, but the main result was that the first motion of the earth as recorded by the seismograph is reduced to about 40 percent of what we previously expected.

Now the first motion is important because this is the way we tell explosions from earthquakes.

In explosions, as I told in my previous testimony to you, the first motion is always outward. You push the earth away by the explosion, and you observe this outward motion at all seismic stations wherever you are.

In an earthquake, on the other hand, you get an outward motion in some directions and an inward motion in other directions, and therefore, if you can observe the seismic signal at many stations, then you can tell an earthquake from an explosion by observing carefully the first motion.

If you find that at all stations the first motion is positive, as we say, outward, upward, then you have an explosion.

If you observe that it is positive at some stations and negative at other stations, then you have almost surely an earthquake.

Now the Geneva Conference of Experts did not write this conclusion down in detail, but generally agreed in the discussions that in order to identify an earthquake one should observe two negative motions: one should have at two seismic stations a clear negative signal, downward signal, where the earth first moves down and then comes back up again.

So it is the first motion which permits you to tell an explosion from an earthquake.

IMPORTANCE OF DISTINGUISHING EARTHQUAKES FROM EXPLOSIONS

Now, why is that important? It is important because there are hundreds of earthquakes each year which give as big a signal as the explosions that we are concerned about, and therefore we must be able to distinguish the earthquakes from the explosions, and the best way we have found so far is this first motion. This is not the only way, but it is the best way, the most established way.

Undoubtedly, as we investigate this further, as we learn more about it we will probably learn other ways, and, for instance, Dr. Press, who has sent you a statement but not testified to you, believes that a very good way of telling earthquakes from explosions is by looking at the surface waves, at the waves which travel along the surface of the earth instead of traveling down and coming back up again.

Senator HUMPHREY. Yes.

Dr. BETHE. He thinks that by looking particularly at the surface waves of very long periods, that he will be able to tell many earthquakes from explosions in the critical area of 5 to 20 kilotons.

Now this he has tried so far only in a few examples, and so we do not know yet how much you can do with this method. But both he and Dr. Oliver of Columbia have had considerable success with this method, and it looks very promising.

[Deleted.]

So first motion is not the only way, but it is still the best way. And, therefore, since first motion is much less than had been anticipated, we have the result that it is more difficult to tell earthquakes from explosions in the region of 5 to 20 kilotons.

WAYS TO IMPROVE GENEVA SYSTEM

Now the question is what you do about it, and in my opinion there are a number, actually a large number, of very good methods to improve the system which was devised last summer in Geneva.

Any one of these methods has to be agreed to by the Russians. However, the Geneva experts' report already contains a very important sentence, namely, it says improvements will undoubtedly be found, and when they are found they shall be incorporated in the system. So we really have this already in the experts' report that something should be done about it.

Now, what are some of the methods by which we can improve detection?

INSTALLATION OF SEISMOGRAPHS IN A DEEP HOLE

The one that I like best is that of digging a deep hole such as a dry oil well. There are lots of dry oil wells in the world, and you can dig a deep hole just like an oil well, even if you do not hope to find oil, and at the bottom of such a deep hole maybe 6,000 feet deep you would install a seismograph.

Now of course, you have to learn to operate a seismograph at the bottom of such a deep hole, and this will have to be studied and investigated just what you have to do.

Now, nobody has operated a seismograph in such a deep hole yet. [Deleted.]

And the predictions of what it will do are, of course, purely theoretical at the present time, but the theoretical prediction is that you might improve your detection capability by a substantial factor.

Now, you will remember that we lost a certain factor as a result of the Hardtack tests.

If we gain a substantial factor back, then we are far better off than we were before.

So if these theoretical predictions about the deep hole are substantiated by actual observations, then we could get a system which is actually better than we originally thought the Geneva system would be.

And so, we just have to hope that the theoretical prediction is right.

I think it is very likely that it will be a good technique, because the trouble of observing seismic signals is that there is noise, that there are always little disturbances of the earth which are always present, and which are worst near the seashore and get better inland, and it is believed that these disturbances are little waves traveling on the surface of the earth.

At the ocean, for instance, the water waves beat against the shore and they set the earth in motion and we get these little surface waves.

METHODS OF DIGGING HOLES

Senator WILEY. Would that add to the distance of detection? Would you want a hole every 600 miles?

Dr. BETHE. You would have to have a hole every 600 miles. It is not all that expensive——

Senator HUMPHREY. When you stop to think we are trying to shoot to the moon, you should not worry about digging a few holes in the earth.

Dr. BETHE. We have methods to dig holes which are well known, from oil exploration, and in one oilfield you have hundreds of holes, and so we might easily put an extra hundred holes in the earth's surface or 200, at all the seismic stations in the system.

Senator WILEY. Well, are you talking about holes that would put down an oil pipe, or are you talking about a hole in which a man would get down 6,000 feet?

Dr. BETHE. No; a man would not get down into it. It is the kind of a hole in which you would stick an oil pipe, and through that hole you lower your seismograph, and then you have an electric cable to bring up the signals so that you can observe the signals on top.

This has to be studied, but I think there is no great difficulty in doing this.

Senator CARLSON. May I inquire how deep you have gone with these tests into the earth?

Dr. BETHE. So far only a very few hundred feet, and there has been an improvement a few hundred feet down. But this is not the test but the observations of the test.

The seismographs have been placed a few hundred feet below ground. They are quieter there than on the surface, but not sufficiently quiet. [Deleted.]

This is the method I like best of all the ones proposed.

Senator HUMPHREY. But the surface wave method would not be excluded?

Dr. BETHE. Certainly not.

Senator HUMPHREY. Or the normal seismograph method?

Dr. BETHE. The normal seismograph method will be installed and the surface waves will also be just on top of this.

Senator HUMPHREY. These are further improvements over what was contemplated at the original Geneva meeting?

Dr. BETHE. That is exactly it.

ESTABLISHMENT OF UNMANNED SEISMOGRAPH STATIONS

Now the second method which I like very much is to put in small stations with just one seismograph, and this on the surface, but put these in not every 600 miles but every 100 miles.

Now, obviously you cannot do this and put observers at each of these posts. First of all, you do not have that many seismologists; and secondly, you would run into objections from the Russians.

But these stations could very well be very simple, and be unmanned. You just put them there. You put them under lock and key with a burglar alarm so people do not tamper with them, and you have some kind of system to transmit the information from the little station to the next big station so that you get a record all the time.

Senator HUMPHREY. Like feed-in units.

Dr. BETHE. That is right. Then every month or so you go there and fill up the gasoline tanks so that the station continues to have power, and take away the record and take it home and look at it again.

These units would be extremely powerful. Namely, at a hundred miles' distance the signal is 200 times as strong as it is at 600 miles'

distance, maybe even 400 times as strong. So that if you had these little stations, then you could easily observe a 1-kiloton explosion and could observe the first motion from a 1-kiloton explosion at something like 10 stations in each case, and this would be an enormous improvement over the system contemplated at Geneva.

Of course, again you have to reach political agreement on this, and this, I think, is where the problem lies; namely, to put it to the Russians forcibly enough that we have to do something to improve on the Geneva experts' system.

But I think there is no question that improvements are possible, and this particular improvement does not require any further study. This is already known: It is known that one can observe signals of sufficient strength; it is known that one can make very cheap and simple seismographs which will do this. And so, the only question then is to make them tamperproof, and to transmit the information.

EFFECT OF IMPROVED DETECTION METHODS

Senator HUMPHREY. In other words, if these improvements of detection and identification are placed in effect, then the new data do not weaken the detection identification system.

Dr. BETHE. That is correct.

Senator HUMPHREY. In fact, according to what you are saying, Dr. Bethe, there would be an improvement in the detection and identification system.

Dr. BETHE. That is correct, yes, if these new components are added to the Geneva system.

Senator HUMPHREY. Well, even the factor of the surface waves would have some beneficial effect, would it not?

Dr. BETHE. It would, but it would not restore us to the Geneva capability.

Senator HUMPHREY. No. It takes more than that.

Dr. BETHE. It takes more than that, because we have to remember that the Geneva system by itself, according to the recent evidence, can only clearly identify explosions above 20 kilotons.

Senator HUMPHREY. Clearly identify?

Dr. BETHE. Clearly identify. And at 10 you already have great difficulty. You maybe identify one-half of the 10 kiloton explosions and that is not enough.

Senator HUMPHREY. Do you have any other suggested improvements?

ADDITIONAL SEISMOGRAPHS AT EACH STATION

Dr. BETHE. Yes. The fourth is just to put more seismographs at every station.

Senator HUMPHREY. Put them in a battery, so to speak?

Dr. BETHE. Put them in a battery. Now, the Geneva system already calls for 10 seismographs at each station. [Deleted.]

But instead of 10 you could put 100. Now, I do not like this method because it is a brute force and an inelegant method, and I prefer elegant methods. But it is a possibility, and I think this possibility very likely but not certainly could bring us back to the capability of the Geneva system as originally envisaged.

Senator HUMPHREY. In other words, by just maximizing the number of seismographs at the agreed-upon number of stations you could bring your capability of detection and identification back to the original Geneva calculations?

Dr. BETHE. So we hope. This is not certain, but it is——

Senator HUMPHREY. Is it certain that it would improve?

Dr. BETHE. It is certain that it would improve it. It is not certain it would bring it back. It might make it even better than the original, but it is not certain that it would fully restore the Geneva capability.

But a combination of these four things, or any two of them, would, I think, with almost certainty, bring us back to the original capability of Geneva.

Senator HUMPHREY. Doctor, you are a man of great competence, and highly respected. Your words of testimony are as important as any testimony that any committee could ever get or obtain on this subject. The Government has placed you in a very important position in relation to the detection and identification of nuclear weapons tests.

DISARMAMENT IN INTEREST OF UNITED STATES

Would you say it would be in the interest of the United States and of the free world to pursue these negotiations at Geneva with the objective of obtaining an agreement on the suspension of nuclear weapons tests?

Dr. BETHE. I think so, very definitely. I believe that the most important point is a political one; namely, to obtain a controlled disarmament agreement, and I think this is an objective which the United States has had ever since the war, and it has never come so close to realization as in this area. And if we once get one controlled disarmament agreement, I believe that others may follow, and that the principle will thereby be established. This, I think, is the overriding argument.

Senator HUMPHREY. What risk are we taking now in terms of our weapons technology? We had here Admiral Burke, General Taylor, and General White, and all three of these gentlemen testified to the effect that an agreement to suspend tests would slow down their weapons development, would impede development of a diversification of weapons, and in essence would limit many of the possibilities of atomic weapons advancement that they had in mind.

I mentioned that the effects on our nuclear weapons development had to be related, of course, to the conditions at present existing between the United States and the Soviet Union.

Dr. BETHE. Certainly.

Senator HUMPHREY. What do you have to say about this point?

EFFECT OF TEST SUSPENSION ON WEAPONS PROGRAM

Dr. BETHE. Well, the generals are undoubtedly right, it would impede our weapons program to a certain extent. It would likewise impede the Russian weapons program. It is my belief that it would impede them and us to about the same degree. I think it is very much a trade-off in this area.

There are certain weapons systems that we are very anxious to develop, particularly missiles, and quite particularly missiles with suitable warheads. [Deleted.]

And in these areas clearly it is very important to have a high yield for a given weight.

We are certainly very good at this now, so we do have at the present time quite respectable warheads for missiles.

It is also true that if we continued to test, the yield from these warheads would get better and higher.

Some of these improvements can be made without tests. [Deleted.]

It is my opinion on the other hand, that they are ahead of us in the missile art.

Senator HUMPHREY. In capability for propulsion?

Dr. BETHE. On the propulsion side. And so they can put in the air or above the air, rather, missiles of greater weight than we can with a similar effort.

ULTIMATE PROGRESS OF SOVIET NUCLEAR WEAPONS PROGRAM

But ultimately I think they will learn the same as we can do also in nuclear warheads. It is likely that for some time to come we might preserve our advantage relative to the Soviets. [Deleted.] But [if testing continues] ultimately they will undoubtedly catch up with us, because ultimately there are simply the laws of nature which limit the possible. [Deleted.]

Senator HUMPHREY. Dr. Bethe, the testimony you are giving here is right to the heart and core of this whole test agreement proposition. It is perfectly true from what you and others have said that the agreement for a nuclear test cessation will obviously slow down weapons development.

Dr. BETHE. Yes.

Senator HUMPHREY. That is one of its purposes.

Dr. BETHE. Exactly.

U.S. LEAD OVER SOVIET UNION IN NUCLEAR WEAPONS

Senator HUMPHREY. I asked a question this morning of Generals Taylor and White: Are we ahead of the Soviet Union in nuclear and thermonuclear weapons, in number, quality, design, variety, and sophistication?

Dr. BETHE. Yes.

Senator HUMPHREY. Their answer was "Yes." Do you think so?

Dr. BETHE. I think so.

Senator HUMPHREY. Are we substantially ahead of them?

Dr. BETHE. Yes.

Senator HUMPHREY. If that is the case, then would it not be in our national interest to slow down the weapons development. [Deleted.]

Dr. BETHE. That is certainly correct. [Deleted.]

Senator HUMPHREY. I recall your testimony last year to the effect that, in 1955 when the Soviets first came to the United Nations with their propaganda barrage, saying, "Let's stop the tests." We had a substantial lead on them at that time. You further said that, had the tests been stopped then, their weapons technology would have been far, far behind ours. Is that correct?

Dr. BETHE. That is correct, and I will stand by this completely.

AUTHORITATIVE STATUS OF WITNESS

Senator HUMPHREY. You are an expert in this.

Dr. BETHE. Yes.

Senator HUMPHREY. You are a consultant to several agencies in the executive branch which enables you to give anthoritative testimony on this subject?

Dr. BETHE. That is right, and this testimony I will repeat today.

Senator HUMPHREY. This is a terribly serious subject. I have looked to you as a guiding light in regard to the technology that all this involves. I am sure that my colleagues feel the same way.

Dr. BETHE. Yes.

Senator HUMPHREY. You are a member of the President's Advisory Committee, a consultant to the Atomic Energy Commission and the Defense Department, and you were a consultant to the State Department for the two Geneva conferences, one on the technical means of detecting tests and the other a political conference to draft a treaty on the discontinuance of nuclear weapons tests.

Dr. BETHE. Yes.

CONCLUSION OF INSPECTION AGREEMENT IN NATIONAL INTEREST

Senator HUMPHREY. Is it your view, then, that if we can sign an agreement, the kind of agreement that our Government would sign, would it be in our national interest?

I am talking of an agreement in which there would be no veto on the part of the Soviet Union regarding the effective operation of the control system. I am talking of an agreement in which we would be doing the inspecting in the Soviet Union and not one in which the Russians would be inspecting themselves.

Dr. BETHE. That is right.

Senator HUMPHREY. I am talking about the kind of an agreement wherein improvements in detection and identification would be permissible.

If that kind of agreement could be signed, would that be to our national interest?

Dr. BETHE. I think so.

Senator HUMPHREY. This is your considered judgment?

Dr. BETHE. This is my considered judgment.

Senator HUMPHREY. Have you so advised our officers in the political level of government?

Dr. BETHE. I think I should not say.

Senator HUMPHREY. Pardon me. Well, I surely do not want you to testify to anything that you should not.

Dr. BETHE. Yes.

Senator HUMPHREY. I have the greatest respect for you, Doctor, but in your role in the Government you have been consulted. That is fair to say, is it not?

Dr. BETHE. That is correct, and this is my opinion.

Senator HUMPHREY. Yes, sir.

NECESSITY FOR AN ENFORCIBLE AGREEMENT

Senator WILEY. I think it was implied in what you said that you mean an agreement which can be enforced and inspected? Is that right?

Dr. BETHE. Absolutely.

Senator WILEY. In other words, a good many people think if we pass a law, we could abolish war and we could bring peace. A lot of people think by making simply an agreement with somebody, that is the end of it.

The fact of the matter is, I think the record shows that out of 52 agreements we had with the Kremlin, 50 of them they violated.

Now, an agreement with that kind of an individual or nation, is not worth very much. The Kaiser said, as you know, that a treaty is but a scrap of paper.

Dr. BETHE. Yes.

Senator WILEY. We and the rest of the world learned a mighty good lesson. This time we have got to keep our eyes open and our powder dry; do we not?

Dr. BETHE. I absolutely agree. The agreement must be enforcible, it must be—there must be a control organization and we have consistently taken this point of view in the Geneva negotiations. And perhaps the most important thing is the right to inspect suspicious events; this right we must have.

Senator WILEY. Was there any indication that the Kremlin officials would go all the way in regard to installing an inspection system?

EXTENT OF SOVIET AGREEMENT

Dr. BETHE. They have gone a long way already. Whether they will go all the way, we cannot tell. They have agreed first of all that there be one treaty embodying both the control system and the test cessation. This was a very difficult part of the negotiations, as you may know.

They have agreed that there be a considerable number of foreign scientists at each observation post. Originally they wanted one controller.

They have agreed in principle to inspection, but there our opinions are still miles apart, because they want to be able to veto an inspection, and this we cannot tolerate.

They have agreed now to peaceful explosions as part of the general agreement. They have agreed to a whole lot of things, and I am quite hopeful, but it is much too early to say whether we can really come to an agreement that we can honestly subscribe to, and this we must have.

Senator CARLSON. Mr. Chairman, may I get in on this?

Senator HUMPHREY. Yes, indeed.

Senator CARLSON. The thing that concerns me a little, Doctor, is that you have been talking about elimination of these tests for weapons development. What happens to the testing that we have for peaceful use, and how can you determine which is which?

MECHANISMS FOR PEACEFUL TESTING

Dr. BETHE. I suggest two separate mechanisms for these peaceful tests. One is that each of the nuclear powers set aside a stockpile of present stockpile devices which would be put under United Nations guard and which would include devices of different strengths, which could then be used when needed for peaceful explosions, for peaceful applications.

Senator CARLSON. In other words, you can separate them.

Dr. BETHE. And this would insure that none of the nuclear powers would test a device which has not been tested before the 1st of January 1959, let us say, because these would all be devices which are actually in our national stockpile, and they would have to be taken out, and we could not add any new ones.

Senator CARLSON. Thank you very much.

Dr. BETHE. There is a second method which might be considered, that is to use a nuclear explosive which we can show at least to the Russians and the British, because we know that they have similar ones, so that we would open the package to them and tell them, "Look, this is what we have. You know perfectly well that this is not a new development," and let them check that we are not using this for weapons development; and we would expect exactly the same from the Russians if they want to make peaceful tests.

Senator HUMPHREY. Dr. Bethe, if we could sign an agreement at the political negotiations presently underway at Geneva, that embodied in one treaty the report of the Conference of Experts at Geneva, including that proviso that new improved methods shall be incorporated, would we be safe? Would we be entering into an agreement, in your judgment, that was directed toward our national interests?

Senator WILEY. May I ask this: How about China? How about that long stretch of Asia? What about Africa? Are there representatives of them at Geneva agreeing to put up these stations every 600 miles, or every 100 miles?

RECOMMENDATION FOR ADOPTION OF TECHNICAL IMPROVEMENTS

Dr. BETHE. In regard to Senator Humphrey's question, I would like the present conference to take positive action on the seismic detection system, and I would like this to be incorporated in the present agreement rather than leaving it to the future commission to incorporate these improvements.

I would like the same to happen about detection of high-altitude explosions.

Senator HUMPHREY. Yes. We discussed this last time.

Dr. BETHE. At the summer Conference of Experts, they discussed but did not make any recommendations on high-altitude explosions. And I think it is necessary, before we finish the present conference, that something be settled on the observation of high-altitude explosions.

I think we have good methods, but we have to have an agreement that these good methods should be part of the system.

Senator HUMPHREY. What do you mean, we have good methods? I thought we did not have any method.

Dr. BETHE. We have in the meantime devised a few methods of observation.

Senator HUMPHREY. Are they good ones?

Dr. BETHE. They are good ones except for explosions at extremely large distances. I will be glad to testify about that, but I think I should first answer Senator Wiley's question.

Senator HUMPHREY. Yes; please do.

Dr. BETHE. But to summarize, I would like the Geneva Conference to incorporate what you say, plus specific devices, specific apparatus, to cope with the seismic situation and the high-altitude situation.

Does that answer your question?

Senator HUMPHREY. Yes.

COMMUNIST CHINA AND INSPECTION SYSTEM

Dr. BETHE. Now to Senator Wiley's question.

It seems extremely important to me that China be part of the system.

Senator WILEY. What I am getting at is this: What kind of an agreement would you have even if you had an agreement with the Kremlin? We have seen its duplicity all over the world. It says it will agree not to test any of these explosions. There is China, with its vast expanse.

Dr. BETHE. Yes.

Senator WILEY. There are other places where the Kremlin is dominant. They could make their tests there. They would not have to make them in their own country where you have got the stations.

What I am getting at is this: This is one world, as we say, and there is no need of our befogging our intellects with a dream that we can make an agreement with the Kremlin to limit it in cases of this kind to its own territory when it is reaching out everywhere to take over and to dominate.

Dr. BETHE. Senator, I am worried about China, and we should make provision that would stipulate that the nuclear powers must not cause or support any tests in other countries.

Now, I agree with your reaction to this. [Deleted.] If this is to be a permanent system, then we have to have to insist that China form part of the system and that China permit the same system on her territory as we have on Russian and United States territory. [Deleted.]

You know very well, Senator, that this is a touchy subject with us as well as with the Russians, since we do not recognize the Government of China. But this has to be brought up as one of the stages which will lead to a worldwide system.

It has been agreed already at the summer conference that the system has to be worldwide; that there have to be stations on islands, that there have to be stations in all countries. [Deleted.]

Senator HUMPHREY. It also depends upon our willingness to talk about China.

Dr. BETHE. Definitely.

Senator HUMPHREY. It is very difficult to have international taboos.

Dr. BETHE. Definitely.

Senator HUMPHREY. You can have them in tribal societies, but when you get to more cultured and sophisticated society you sort of have to recognize reality.

Dr. BETHE. You certainly have to, and on this subject we must talk to the Chinese. Otherwise, we cannot have a worldwide system.

AFRICA AND INSPECTION SYSTEM

Senator WILEY. But think of that big stretch of Africa. What if it should happen that the Kremlin and Nasser get together? What if they get down into the desert and conduct experiments?

Dr. BETHE. We shall have stations in Africa, too.

Senator WILEY. If you are talking about having them down there every 600 miles or every 100 miles——

Dr. BETHE. It would not be quite as dense as that, because most of this territory is not seismic, so it will be a thousand-mile net, but still we shall have stations. And Africa, although there is much Communist propaganda, most of Africa is still under the control of the free world, so we can install the stations without much difficulty.

EXISTING SEISMOGRAPH STATIONS

Senator HUMPHREY. We already have a network of seismic stations around the world.

Dr. BETHE. We do, but——

Senator HUMPHREY. I mean the world has a set of seismic stations which can be used supplementally, can they not, according to the Geneva agreement?

Dr. BETHE. They can, but they are mostly not of very high quality, and they do not come up to the standards of the Geneva recommendations.

Senator HUMPHREY. I must say that the Coast and Geodetic Survey stations were a little bit better than some of those that you had for the special tests.

Dr. BETHE. That is correct.

Senator HUMPHREY. At least, if they worked, the special test stations did not reveal the information to the hungry American public. I got my information about the Rainier tests not from the Atomic Energy Commission, but from Coast and Geodetic.

Dr. BETHE. Well, the stations are of different quality. We have some very good ones and some are less good, and of course the special stations set up for the purpose of observing Logan and Blanca were not as good in general as the permanent stations, but the Geneva proposal stations are much better still than almost any now existing stations.

DETECTION OF VERY HIGH ALTITUDE TESTS

Senator HUMPHREY. Dr. Bethe, what means of inspection do you suggest for the superhigh altitude nuclear tests?

Dr. BETHE. I believe the best way of observing such explosions is from satellites. We should put up a number of earth satellites.

Senator HUMPHREY. I should say we should.

Dr. BETHE. We should also for other reasons. But these particular ones to be equipped with detecting equipment for the detection of the radiations which emanate from nuclear explosions.

The nice point about this is that in empty space the radiations travel unhindered over terrific distances. [Deleted.]

Senator WILEY. How far apart?

[Deleted.]

Senator HUMPHREY. Is what you are talking about feasible?

Dr. BETHE. This is entirely feasible.

Senator WILEY. Manned?

Dr. BETHE. No; not manned.

Senator HUMPHREY. Instrumented?

Dr. BETHE. Instrumented.

Senator HUMPHREY. Dr. Bethe, the establishment of satellite observation stations for the purpose of detection and identification of nuclear explosions in outer space is realistic, feasible?

Dr. BETHE. Yes.

Senator HUMPHREY. And within our capability?

Dr. BETHE. Definitely. [Deleted.]

PRODUCTIVENESS OF GENEVA CONFERENCES

Senator HUMPHREY. Do you think both these conferences at Geneva, first the Conference of Experts and then the political conference, have been productive in terms of learning more about this whole problem?

Dr. BETHE. Yes; very much so.

Senator HUMPHREY. It has compelled us to do a good deal of hard research, has it not?

Dr. BETHE. It has. It has also shown us how the Russians negotiate, and it has been very valuable from this point of view, and it has brought some very solid concessions by the Russians.

Senator HUMPHREY. So far we have not made too many concessions of any appreciable degree, have we?

Dr. BETHE. We have not. The major concession we have made is to separate the test cessation problem from other problems.

Senator HUMPHREY. Yes.

Dr. BETHE. From other disarmament problems.

Senator HUMPHREY. That was not a technical concession.

Dr. BETHE. No; that was not technical.

Senator HUMPHREY. That was a political one.

Dr. BETHE. Technically, so far as I am aware, we have not made any major concession.

Senator HUMPHREY. Did you feel at the Geneva Conference last summer, Dr. Bethe, that we were further advanced in the field of detection and identification than the Soviets?

Dr. BETHE. I definitely think so.

Senator HUMPHREY. I had the feeling from reading the reports that we were.

Dr. BETHE. I have this feeling very strongly. In last summer's conference, I think it was very evident that this was the case.

Senator HUMPHREY. Gentlemen, we could have Dr. Bethe here all day. It is like sitting at the table with Socrates.

Dr. BETHE. Thank you, Senator.

NEED FOR ENFORCIBLE AGREEMENT

Senator WILEY. I want to say that I have enjoyed meeting him again and listening to him. In looking at him, I am sure he is not going to be taken in by the Russian representatives. So many

nations have in the past, and not only lost their shirt but lost their freedom. The main thing is that if we get an agreement it is the kind of an agreement that is enforcible, which is of such a nature that we do not give up important rights which will operate to our own detriment.

I am perfectly willing to deal with anybody that is honest and aboveboard, but I think as a member of this body I have to constantly bear in mind that the Army and the Navy and the Air Force and the President and the Congress of the United States were asleep at Pearl Harbor. We thought it could not happen. I will never forget that.

To me, the world has been made awfully small of late by man's ingenuity, so small that we are only 15 minutes away from one of these bombs. It seems to me that that should make us keep the word "caution" constantly in mind, because you are dealing with the liberties and the future of this country. I know sir, that you will be on guard.

That is all I want to say.

Senator HUMPHREY. Dr. Bethe, again I want to thank you for your wonderful cooperation and the expertise knowledge that you bring to us.

Dr. BETHE. Thank you very much, Senator.

Senator HUMPHREY. I say that I think it is wonderful that a man will give his time and talents as you do to our Government. I know that you do it at considerable personal sacrifice.

Senator CARLSON. Mr. Chairman, could I concur in that statement? I sat here this afternoon as a very junior member of this Foreign Relations Committee, and it gives me a feeling of not only security but satisfaction that we have dedicated men in this field.

Senator HUMPHREY. It is wonderful.

Dr. BETHE. Thank you.

Senator HUMPHREY. Thank you, my dear friend. Thank you very much. We shall consider this portion of the hearing closed.

APPENDIX

EXP/NUC/28
20 August 1958

REPORT OF THE CONFERENCE OF EXPERTS TO STUDY THE METHODS OF DETECTING VIOLATIONS OF A POSSIBLE AGREEMENT ON THE SUSPENSION OF NUCLEAR TESTS

(Original in English and Russian)

CONTENTS

I. Introduction.
II. Basic methods for detection and identification aof nuclear explosions.
A. Method of recording acoustic waves for the detection of nuclear explosions.
B. Method of using radioactive debris for detecting and subsequently identifying nuclear explosions.
C. Method of recording seismic waves for the detection of nuclear explosions.
D. Method of recording of radio signals for the detection of nuclear explosions.
E. Methods of detecting nuclear explosions carried out at bigh altitudes (more than 30-50 kilometers) above the earth.
F. Recommendations on methods.
III. Technical equipment of the control system for the detection and identification of nuclear explosions.
IV. A control system for detecting violations of a possible agreement on the suspension of nuclear tests.
Annexes I–VII (omitted).

I. INTRODUCTION

A. In accordance with an agreement reached as a result of an exchange of letters between the Chairman of the Council of Ministers of the Union of Soviet Socialist Republics, N. S. Khrushchev, and the President of the United States of America, Dwight D. Eisenhower, regarding the calling of a conference of experts to study the possibility of detecting violations of a possible agreement on the suspension of nuclear tests, there began on 1 July 1958, in Geneva, in the Palais des Nations, a conference of, on the one hand, experts from Western countries and, on the other hand, delegations of experts of the Union of Soviet Socialist Republics, the Polish People's Republic, the Czechoslovak Republic, and the People's Republic of Romania.

B. The Secretary General of the United Nations was represented at the Conference by his Personal Representative, Mr. T. G. Narayanan. Conference facilities and Secretariat services were provided by the United Nations. The Experts express their appreciation for the good offices of the Secretary General and his Personal Representative, and for the services of the Secretariat staff attached to the Conference.

C. The agenda for the Conference, adopted on 4 July, included the following main questions:

1. Exchange of opinions on the problem of the various methods for detecting atomic explosions and on other general problems of the Conference deliberations.

2. Determination of a list of basic methods of systematic observations for phenomena indicative of an explosion.

3. A system for controlling the observance of an agreement on the cessation of nuclear tests.

4. Drawing up a report of experts to the governments of those countries represented at the Conference, with conclusions and suggestions regarding a system for controlling the observance of an agreement on the cessation of nuclear tests.

D. The Conference held 30 official sessions and completed its work on 21 August 1958. By prior agreement the Conference held its sessions in private.

E. The Conference of Experts considered the phenomena accompanying nuclear explosions set off under various conditions.

F. Some of these phenomena, namely the acoustic waves occurring when there are explosions in air and in water, the seismic oscillations that occur when there are explosions on the ground, under the ground, and under water, the radio pulses that are produced when there are explosions in the atmosphere, and the optical and gamma radiation when propagated over long distances, serve to indicate explosions and to estimate their time and place.

86042—59—pt. 1——13

G. When nuclear explosions occur in the atmosphere the radioactive debris which is formed mixes in the atmosphere, and is dispersed over great distances. If a nuclear explosion is set off in the ocean or in the earth's crust, the radioactive debris will remain concentrated close to the site of the explosion for a considerable time.

H. The sensitivity of modern physical, chemical, and geophysical methods of measurement makes it possible to detect nuclear explosions by the indications described above at considerable distances, as hereafter described. Thus it is known that explosions of high yield which are set off on the surface of the earth and in the lower part of the atmosphere can be detected without difficulty at points of the globe which are very remote from the site of the explosion. On the other hand, explosions which are of low yield (a few kilotons) can be detected with good reliability given the present state of observational techniques only if there is a specially set up control system such as that suggested in Section IV of this report.

I. A basic difficulty in detecting and identifying small explosions arises because many natural phenomena (earthquakes, thunderstorms, and others) give signals which are similar to those produced by explosions, or which by their presence hinder the detection of the signals sought.

J. The discrimination of the signals of natural events from signals of explosions is aided by a careful analysis of the recorded data, taking into account readings obtained at several points. Those remaining unidentified events which could be suspected as being nuclear explosions might be resolved by inspection of the site.

K. The Conference of Experts has considered the methods of detecting nuclear explosions by the acoustic, hydroacoustic, and seismic oscillations which they produce in the air, water, or in the earth's crust, and also the detection of explosions by the electromagnetic oscillations which are propagated from them, and by the radioactive debris that the explosions cause.

L. The Conference has examined the effectiveness and limitations of each of these methods for the detection of nuclear explosions and it has agreed that the combined use of the various methods considerably facilitates the detection and identification of nuclear explosions.

M. After examining the separate methods, the Conference examined the question of the technical equipment of the control system necessary to detect and identify nuclear explosions, and, after that, it passed to the question of the control system as a whole.

N. As a result of the examination of those questions the Conference reached the conclusion that it is technically feasible to set up, with the capabilities and limitations indicated in Section IV of this report, a workable and effective control system for the detection of violations of an agreement on the worldwide cessation of nuclear weapons tests.

O. In the present report information is given about the various methods of detection and identification of nuclear explosions, about the technical equipment of a control system and about a control system as a whole. Copies of the individual documents containing the conclusions adopted by the Conference on each of the questions mentioned are attached to the present report. Verbatim records and working documents in the working languages of the Conference will follow as soon as they are available for attachment to the report.

II. BASIC METHODS FOR DETECTION AND IDENTIFICATION OF NUCLEAR EXPLOSIONS

A. Conclusions as to the applicability of the method of recording acoustic waves for the detection of nuclear explosions

The Conference of Experts examined the process of propagation of the acoustic waves caused by nuclear explosions and the methods of recording these waves with the aim of determining the possibility of using them for detecting nuclear explosions.

1. When there are explosions in air, a strong air acoustic wave is formed which propagates over large distances. An indication of the amplitude of the air pressure wave is given by a formula which is approximately valid for a homogeneous atmosphere and according to which this amplitude is proportional to the cube root of the yield and inversely proportional to the distance. However, the amplitude of this acoustic wave is strongly dependent upon meteorological conditions and cannot be predicted accurately by a simple formula of such a kind. The observed amplitude in certain cases can be five times larger or smaller than that predicted by a formulation which includes only the energy release and the distance to detecting station.

2. Existing apparatus of special design can detect the air wave from a 1 kiloton explosion in the air above local background noise at relatively large distances.

The detection capability of a single station is strongly dependent upon the orientation of the propagation path to the station with respect to the upper winds. When the upper winds are mainly in one direction, a 1 kiloton explosion can be detected with a high degree of confidence downwind at a distance of 2,000 to 3,000 kilometers and upwind at a distance of 500 kilometers. When the upper winds are erratic and the average wind is small, such as frequently happens in the spring and fall, detection of a 1 kiloton explosion can be accomplished with a similar degree of confidence to a distance of approximately 1,300 kilometers independently of the direction. On the basis of the records from three stations, the location of the explosion can be determined with an accuracy of better than 100 kilometers.

3. The acoustic apparatus at control posts at the above distances from an explosion can detect explosions which occur between the surface and a height of 30 kilometers. A reasonable extrapolation of existing experience indicates that for explosions taking place up to an altitude of about 50 kilometers there should not be a great change in the detectability of the acoustic wave. Whether a substantial acoustic wave will be generated at higher altitudes is not well known from direct experiment or from any theoretical considerations so far discussed. Deep underground and underwater explosions do not produce air waves sufficiently intense for detection purposes.

An underwater explosion in the oceans generates very strong underwater sound waves (hydroacoustic), which even in the case of small explosions can be detected at distances of about 10,000 kilometers.

4. Acoustic waves which resemble in certain cases the acoustic signals of nuclear explosions may be produced by natural events (primarily meteoric, volcanic, or submarine disturbances). In such cases the identification of the event as natural or as a nuclear explosion must be based on a comparison of acoustic data with those obtained by aid of other methods.

5. It is noted that methods of recording of pressure waves may be further improved to increase the precision and the sensitivity, and to eliminate background noise and spurious signals.

B. Conclusions as to the applicability of the method of using radioactive debris for detecting and subsequently identifying nuclear explosions

The Conference of Experts has studied the process of the dissemination of radioactive debris resulting from a nuclear explosion and has considered the collection of samples of radioactive debris and its analysis as one of the methods for detecting and subsequently identifying nuclear explosions.

1. When an explosion occurs a considerable quantity of radioactive debris is produced. If the explosion is based on a fission reaction then this quantity amounts to 3×10^8 curies per 1 kt TNT equivalent of the energy of the explosion as of 1 hour after the reaction. Thermonuclear reactions will lead to the formation of Carbon 14, Tritium, and other radioactive substances which result from neutron irradiation and which, in principle, can also be used to detect an explosion.

2. When nuclear explosions occur between the earth's surface and a height of approximately 10 kilometers the radioactive debris is thrown into the atmosphere where it is carried by winds to great distances. The concentration of this radioactive debris is greatly influenced by the vertical and horizontal distribution of the wind in the troposphere and in the lower layers of the stratosphere. The concentration is also decreased as a consequence of washing out by rain and gravitational deposition.

3. The distribution by height of the radioactive debris carried in the atmosphere will depend in the first place on the energy of the explosion, on the conditions in which the explosion took place (i.e., on the earth, under the earth, or in the air) and on the meteorological conditions at the moment of explosion. In the case of low-energy explosions in the air up to a height of approximately 10 kilometers the radioactive debris will initially concentrate in a small volume below the tropopause. This debris will gradually get disseminated both horizontally and vertically in the troposphere and in the course of a period of from 1 to 30 days (depending on the turbulence of the atmosphere, the wind structure, and the dimensions of the particles which carry the radioactive substances) it can be detected close to the earth's surface, as also at various heights up to the tropopause.

4. The spreading of the cloud in the atmosphere is determined by many meteorological processes. As a result of the action of these processes the cloud is bound to reach a stage when it is mixed in a vertical direction and spread in a hosizontal

direction in such a way as to afford the most convenient conditions for taking samples.

Calculations and experimental data give ground for considering that this stage will be reached in the period between the 5th and 20th day of the existence of the cloud. Before that period the cloud may be too small, both in its horizontal and its vertical extent. After 30 days have expired a considerable part of the radioactive debris will decay and a sample will constitute a lesser proportion of the natural or other background, thereby making more difficult the detection and identification of an explosion.

5. Existing radiochemical techniques make it possible to detect and identify fresh decay products in a sample of radioactive debris containing about 10^9 fissions. The time of origin of this fresh debris can be determined within 5 to 10 percent of its age if the sample contains about 10^{10} fissions and is not contaminated to any considerable extent by old fission products.

6. The taking of samples on the surface of the earth by a network of control posts makes it possible to carry out continual monitoring of the contamination of the air at many separate points by means of air filtration and also by collecting radioactive fallout and fallout in rain. If control posts are disposed at distances of the order of 2,000–3,000 kilometers then an explosion with an energy of 1 kt set off in the troposphere (0–10 kilometers above the surface of the earth) will be detected with a high degree of reliability in the period of 5 to 20 days although the place of explosion cannot be exactly determined and although the time of explosion will be determined with some error. Calculation shows that with favorable meteorological conditions an explosion of even lesser energy can be detected in this way.

In the course of the period of time of from 2 to 5 days after an explosion of energy equivalent to 1 kt the collection of a sample of radioactive debris from the explosion which is suitable for analysis can be effected in the air by an aircraft if the area of the supposed location of the cloud is known approximately. The taking of such a sample will make it possible to establish approximately the point of the explosion by means of using meteorological data for backtracking the trajectory of movement of the cloud.

7. Underground or underwater explosions set off at shallow depths and accompanied by the throwing up of earth or water can also be identified by the method of collecting radioactive samples although with lesser reliability than for explosions of the same energy in the troposphere.

8. The Conference of Experts considers that systematic measurements of radioactive substances in the air and also the collection of radioactive aerosols deposited on the ground and measurements of the radioactivity of precipitation can be successfully used for the detection of nuclear explosions and also, in many cases, for assessing certain parameters relating to them even in the absence of other indications.

The utilization for a regular control service, as a method for detecting nuclear explosions, of the taking of samples of the air by aircraft over oceans can be used for detecting nuclear explosions. For this purpose use should be made of existing aircraft flights over the oceans which are carried out by various countries for the purposes of meteorological observations.

9. The Conference of Experts considers that the method of taking samples of radioactive debris can also be used successfully for subsequent investigation of the fact of a nucear explosion in those cases when there are the appropriate indications from other methods.

For this purpose it is possible to use the detection of radioactive debris remaining at the point of the supposed explosion (on the earth's surface, under the earth, in the water) and also the determination of the presence of a radioactive cloud in the period between 2 and 5 days after a supposed explosion in the atmosphere in the area where the cloud is calculated to be by the time of investigation.

In such a case search for the radioactive cloud can be made on an aircraft having equipment for the taking of a sample of radioactive debris. To this end use should be made chiefly of the aircraft flights over the oceans made for the purposes of meteorological observations.

10. In some cases use can be made of aircraft flights over the territories of the U.S.A., the U.S.S.R., the U.K., and other countries to collect air samples for the purpose of checking on data obtained by other methods of detection of nuclear explosions.

The Experts consider that to accomplish this task it would be quite sufficient to make use of the aircraft of the country being overflown and that in such cases it is sufficient that flights for the purpose specified should be made along routes

laid down in advance. Representatives of the U.S.S.R., the U.S.A., the U.K., or other States participating in the operation of the control system may be on board these aircraft in the capacity of observers.

11. The Experts note that in the course of time the sensitivity and efficiency of the method of collecting radioactive debris will increase as a consequence of the atmosphere becoming cleared of the radioactive products it contains, and also as a result of the perfection of the techniques for collecting and analyzing samples.

C. Conclusions as to the applicability of the method of recording seismic waves for the detection of nuclear explosions

The Conference has considered the processes of propagation of seismic waves generated by nuclear explosions and the methods for recording these waves for the purpose of determining the possibility of using them for the detection of underground and underwater nuclear explosions.

1. When nuclear explosions occur under the ground or under the water, longitudinal, transverse, and surface waves are formed and get propagated to great distances. The first longitudinal wave is the most important, both for detecting an explosion and for determining the place of the explosion, and also for distinguishing an earthquake from explosions. Transverse and surface waves also help to define the nature of a seismic perturbation.

2. Longitudinal seismic waves caused by underground nuclear explosions set off under conditions analogous to those in which the Rainier* shot occurred can be detected and the direction of first motion of the longitudinal wave can be determined at a distance of approximately 1,000 kilometers, and also at distances of approximately 2,000–3,500 kilometers at sites which are considerably more quiet than the average for—

(*a*) Explosions of the order of 1 kiloton recorded during periods of favorable noise conditions;

(*b*) Explosions of the order of 5 kilotons recorded during periods of unfavorable noise conditions.

It must be noted that all seismic stations situated at thousands of kilometers from one another cannot have an identically high or identically low level of background at one and the same time.

3. Conditions for detection and identification of underwater explosions set off in shallow water but at a sufficient depth, are considerably more favorable than conditions for detecting undergound explosions.

4. Control posts carrying out seismic observations should be put at sites with a minimal level of microseismic background, such as are possible in internal continental regions. Such stations, when provided with arrays of seismographs, can insure the obtaining of the data indicated above. However, at stations which are in unfavorable regions such as coastal and island regions the noise level will be higher than at quiet stations inside continents. In these cases for detection and determination of the sign of first motion the energy of the explosion must increase in the ratio of the power of 3/2 with respect to the increase of background level. This is in part compensated by the fact that quiet stations inside continents will register more powerful explosions at distances of from 2,000 to 3,500 kilometers. Bursts with an energy of 5 kilotons and more will be detected by quiet stations placed at the distances named.

5. The majority of earthquakes can be distinguished from explosions with a high degree of reliability if the direction of first motion of the longitudinal wave is clearly registered at five or more seismic stations on various bearings from the epicenter. Thus not less than 90 percent of all earthquakes taking place in continents can be identified. The remaining 10 percent or less of cases will require the analysis of additional seismograms where this is possible; and for this purpose use must also be made of the data of the existing network of seismic stations. If required, these supplementary stations should be further equipped with improved apparatus. In relatively aseismic areas it is sufficient merely to define the position of the epicenter. In this connection cases of detection of seismic events will be regarded as suspicious and will require further investigation with the help of other methods. For those cases which remain unidentified inspection of the region will be necessary.

In regions where the regular disposition of seismic stations in quiet conditions is not possible, the percentage of correct identification of earthquakes will be less.

*The underground nuclear explosion "Rainier" with an energy of 1.7 kilotons (Nevada) was set off in unfavorable conditions for transferring energy to the ground. However, even worse conditions of coupling are possible.

With modern methods and making use of the data of several surrounding seismic stations the area within which an epicenter is localized can be assessed as approximately 100–200 square kilometers.

6. It is noted that the range and accuracy of recording and identifying underground nuclear explosions can be improved in the future by means of perfecting the methods of recording siesmic waves, both by way of perfecting apparatus and also by way of perfecting the methods for differentiating an earthquake from explosions.

D. Conclusions on the applicability of the method of recording of radio signals for the detection of nuclear explosions

The Conference of Experts considered the generation and propagation of radio pulses originating from a nuclear explosion and the methods of recording these signals in order to determine the possibility of using them for the detection of nuclear explosions.

1. In the case of a nuclear explosion in the atmosphere, there arises a powerful electromagnetic radiation (radio signal), caused by the gamma radiation accompanying the explosion. In the case of underground, underwater, or specially shielded explosions radio emissions are not expected which can be recorded at great distances by modern techniques.

When the explosion is carried out on or above the surface of the earth (water) and without specially constructed layers to absorb gamma rays, the energy and spectral distribution of the radio signal are such that its essential components are propagated over the whole terrestrial globe. The strength of the radio signal depends upon certain features of the construction of the bomb and on the altitude of the explosion. An explosion of 1 kiloton yield can be detected by means of radio signals at distances exceeding 6,000 km. assuming that in the neighborhood of the receiving station there is no high noise level from local thunderstorms or other sources.

By radio direction finding methods, it is possible to determine the azimuth of the signal source with an accuracy of about 2°, i.e., about 30 km. at a distance of 1,000 km. The time of production of the signal may be established with an accuracy of several milliseconds. The attainment of such accuracy depends on the choice of sufficiently flat location and on the absence of electrical interference at the receiving site.

2. Lighting flashes emit radio signals in the same frequency range and act as interference for the method of detection of a nuclear explosion by means of its radio signal.

Close to the source of radiation, the forms of radio signals from lightning and from nuclear explosions examined to date are quite different. However, at distances exceeding 1,000 kilometers, due to the distortion of the form of radio signals in the wave guide formed by the earth and the ionosphere, the form of radio signals from some individual lightning flashes is similar to the signal from nuclear explosions. The number of signals from lightning flashes recorded by apparatus without using special techniques of signal selection depends on the sensitivity of the apparatus and on the locality and can amount to from 10 to several hundred signals per second. Existing techniques can be applied to exclude automatically the preponderant majority of signals from lightning. The distinction of the remaining signals due to atmospherics from those due to nuclear explosions requires the application of special methods of discrimination, including criteria on form of signal, spectral distribution, and distance to source of radiation.

In the present state of the technique of the discrimination of signals in some individual cases the record of a signal cannot be identified either as coming from a nuclear explosion or from lightning.

3. The Conference of Experts recommends that further research should be carried out in order to understand more fully the physical properties of atmospherics involved in differentiating signals from nuclear explosions and atmospherics, by means of the development of the theory of this problem, the collection and systematization of data about atmospherics, and the development of suitable automatic instruments. The Conference considers that there are good prospects for improvement of procedures of signal discrimination.

4. Theoretical considerations suggest that recording of radio signals can be used to detect nuclear explosions occurring at altitudes up to the order of 1,000 kilometers.

E. Conclusions on the methods of detection of nuclear explosions carried out at high altitude (more than 30 to 50 kilometers) above the earth

The Conference of Experts has given theoretical consideration to the gamma radiation and neutrons resulting from a nuclear explosion and the conditions of recording them from earth satellites; and to optical phenomena and ionization of the air in the upper layers of the atmosphere in the case of a high altitude explosion (altitudes above 30–50 kilometers) and has arrived at the following conclusions:

1. A kiloton nuclear explosion produces at its source delayed gamma rays from fission products, and prompt gamma rays and neutrons. The number of prompt gamma rays and neutrons depends upon the construction of the device and upon the materials surrounding it. The delayed gamma rays are insignificantly affected by these factors. At a distance of 10^4 kilometers in vacuo, typical quantities of radiation from a 1 kiloton fission explosion are:

(*a*) Delayed gamma rays
10^4 quanta/cm.^{2} during the first second

(*b*) Prompt gamma rays*
10^2 quanta/cm.^{2}
distributed over a time of about 10^{-7} seconds

(*c*) Neutrons
10^4 neutrons/cm.^{2}
distributed over a time of a few seconds.

The cosmic background at the height at which earth satellites orbit is under study at the present time, attention being paid to the quantity, nature, and energy of the particles; however, on the basis of preliminary data, it can be considered that the detection of an explosion from an earth satellite is possible, by means of registering the gamma rays accompanying the nuclear reaction, neglecting shielding, and also by means of registering the gamma rays of the fission products and the neutrons. If both prompt gamma rays and neutrons are registered, it is possible to get some idea of the distance to the explosion. The use of gamma rays from a nuclear explosion will make it possible to detect the explosion in cosmic space at a distance of the order of hundreds of thousands of kilometers from the earth. Estimate of the maximum distance for the detection requires data concerning the magnitude of the cosmic radiation at the orbit of the earth satellite. If there is an explosion at a height of 30–50 km. and above, and if the height at which the earth satellite orbits is some thousands of kilometers, one can neglect the absorption of gamma quanta in the upper layers of the atmosphere. The Conference of Experts considers that it is possible to use for the detection of nuclear explosions at high altitudes the registration of gamma radiation and neutrons with properly instrumented earth satellites.

2. In the case of an explosion at a great height light will be emitted at the point of the explosion and there will be luminescence in the upper layers of the atmosphere under the action of X-rays and fast atoms from the materials in the device. Light phenomena may be detectable from the surface of the earth in clear weather at night with the help of simple apparatus; in day time with the help of more sensitive apparatus. In cloudy weather the detection of optical phenomena from stations on the earth's surface would probably be extremely difficult.

The radiation from a nuclear explosion creates in the upper layers of the atmosphere a region of increased ionization which is detectable by the absorption of cosmic radio signals or by anomalies in the propagation of radio waves.

Our knowledge of the absorption of cosmic noise by ionospheric phenomena is not sufficient to determine the number of natural events similar to those resulting from a nuclear explosion.

The Conference of Experts considers that it is possible to use the recording of ionospheric phenomena, using appropriate radio techniques, and of optical phenomena for the detection of nuclear explosions at high altitudes.

3. The Conference of Experts has not considered the problem of the detection of nuclear explosions which might be conducted in cosmic space at distances of millions of kilometers from the earth.

F. The Conference has recommended the inclusion of the first four of those methods in the number of basic methods for detecting nuclear explosions by means of a network of control posts, and considers it possible to use several methods for detection of nuclear explosions at high altitudes as stated in IIE1 and IIE2.

*Special shielding of the exploding device can considerably reduce the gamma radiation accompanying the reaction, but cannot reduce the radiation from fission products. However, such shielding involves increasing by several times the weight of the whole device.

III. CONCLUSIONS ON THE QUESTION OF THE TECHNICAL EQUIPMENT OF THE CONTROL SYSTEM FOR THE DETECTION AND IDENTIFICATION OF NUCLEAR EXPLOSIONS

The Conference of Experts has considered the questions related to the technical equipment of a control net intended to detect and identify nuclear explosions, and has come to the following conclusions:

1. The posts of the control net situated in continents should regularly be equipped with apparatus for the detection of explosions by the acoustic and seismic methods and also by the methods of recording radio signals and of collecting radioactive debris.

2. Certain posts situated on islands or near the shores of oceans should be equipped, in addition to the methods just mentioned, with apparatus for hydroacoustic detection of explosions.

3. Posts located on ships stationed or drifting within specified ocean areas should be equipped with apparatus for the detection of explosions by the method of collecting radioactive debris and by the hydroacoustic method. The method of recording radio signals and the acoustic method might also be used on ships if suitable equipment is developed, but the effectiveness of these two methods, particularly the acoustic one, will be considerably less than on land.

4. The apparatus installed at posts of the control network must be uniform and must satisfy the following basic technical requirements:

A. Seismic apparatus

The seismic apparatus of the control post should include:

(1) Approximately 10 short-period vertical seismographs dispersed over a distance of 1.5–3 kilometers and connected to the recording system by lines of cable. The seismographs should have a maximum magnification of the order of 10^6 at a frequency of 1 c.p.s. and a receiving band adequate to reproduce the characteristic form of the seismic signal;

(2) Two horizontal seismographs with the parameters indicated in point (1);

(3) One three-component installation of long-period seismographs having a broad receiving band and a constant magnification of the order of 10^3–2×10^3 in the period range 1–10 seconds;

(4) One three-component installation of seismographs with a narrow receiving band and magnification of the order of 3×10^4 when T=2–2.5 seconds;

(5) At certain posts one three-component installation of long-period seismographs with magnification of the order of 10^4–2×10^4 at periods of T=25 seconds;

(6) Auxiliary equipment necessary in order to get precise records of the seismic signal; recording devices, chronometers, power supply units, and apparatus for receiving automatic radio signals giving correct time.

The seismic apparatus should be installed in places with a minimal level of microseismic background, away from industrial areas, and on outcrops of bedrock (where possible). The seismographs should be installed in suitable vaults.

The area required for installing the seismic apparatus should be about 3 x 3 kilometers.

B. Acoustic apparatus

(1) The infra-acoustic equipment for a control post should include not less than three sets of microbarographic units each of which should have a system for averaging out turbulent noise, a pressure sensing unit, a transmission line and appropriate electronic amplifiers and automatic writing instruments;

(2) The sensitivity of the microbarographic stations must ensure recording of acoustic signals in the period range 0.5–40 seconds, with an amplitude of 0.1 dynes per $cm.^2$;

(3) The pressure sensing units of the microbarographs should be dispersed at about 10 kilometers from one another in order to determine the direction of arrival of the acoustic signal and the speed of propagation of the signal;

(4) The hydroacoustic apparatus for a post, which is recommended for use only in oceanic zones, should include several hydrophones placed in the main submarine sound channel.

The hydrophones should be connected with the recording station on the coast by cables. Recordings of the hydroacoustic signal should be made in several frequency subranges, covering a general frequency range of from one cycle per second to several thousand cycles per second.

The infra-acoustic equipment operates best in areas of low surface winds and flat terrain covered with trees or shrubs.

C. Apparatus for recording a radio signal

The apparatus for recording a radio signal should consist of:

(1) A loop-shaped radio direction finder or a radio direction finder with vertical antennas dispersed 4–5 kilometers from one another, with a frequency range of 10–15 kilocycles per second which will detect signals as low as 2 millivolts per meter;

(2) A device for recording the form of the signal, the device to provide recording of the form of the radio pulse in a frequency range 500 c.p.s.–200 kilocycles per second when the intensity of the field is 10 millivolts per meter and more;

(3) An automatic selecting device based on separating out the characteristic electromagnetic signals accompanying nuclear explosions by their form, by their spectral density and by their amplitude and a device for analyzing the signal spectrum that provides display of the spectral density of the signal in the frequency range 6–100 kilocycles per second. Although existing techniques exclude the preponderant majority of signals from lightning, further advantage will be taken of information from the acoustic, seismic, or other basic methods of detection to aid in further discrimination between signals from nuclear explosions and from lightning flashes;

(4) The requisite measuring and auxiliary apparatus and also power-supply units and means for obtaining correct radio time signals.

The site on which the antennas and the electromagnetic recording apparatus are disposed should be on flat or rolling terrain with about 300 meters clear space around the antennas, and distant from sources of electrical interferences, power lines, and communications lines.

D. Apparatus for collecting and analyzing radioactive debris

The apparatus for collecting and analyzing radioactive debris should include:

(1) A large filtering installation with a throughput capacity of 2×10^4 cubic meters of air over 10–24 hours, and which is usd on a 24-hour basis;

(2) Equipment for collecting radioactive depositions—a surface with about 100 square meters area should be used. During dry weather, the surface can be washed down to collect dry fallout;

(3) A laboratory for simple radiochemical analysis.

Apparatus should be located in open areas, preferably on high ground, with high precipitation frequency. Apparatus should not be located in cutoff valleys or near regions with high natural background.

E. Apparatus installed on aircraft for collecting radioactive debris and detection of a radioactive cloud

(1) A filtering installation for aircraft should provide for the collection of the maximum quantity of the products of radioactive decay, the rate of filtering being about 3,500 cubic meters an hour.

(2) The aircraft utilized for the collection of radioactive debris should have equipment for the comparatively fast determination of the presence of fresh radioactive debris.

(3) A small radiochemical laboratory will be located at each base for routine aircraft sampling flights.

Aircraft flights over ocean areas should be laid out as nearly as possible in approximately a north-south direction, and located near the sides of the major continents, as well as in the center of oceans remote from continents.

5. All the apparatus of the control posts should be designed for reliable continuous operation.

6. Improved apparatus and techniques should be actively developed and expeditiously incorporated into the control system for the purpose of continuously improving the effectiveness for the detection and identification of nuclear explosions.

IV. CONCLUSIONS ON A CONTROL SYSTEM FOR DETECTING VIOLATIONS OF A POSSIBLE AGREEMENT ON THE SUSPENSION OF NUCLEAR TESTS

The Conference of Experts, having considered a control system for detecting violations of a possible agreement on the syspension of nuclear tests, has come to the conclusion that the methods for detecting nuclear explosions available at the present time, viz, the method of collecting samples of radioactive debris, the methods of recording seismic, acoustic, and hydroacoustic waves, and the radio-signal method, along with the use of on-site inspection of unidentified events which could be suspected of being nuclear explosions, make it possible to detect and identify nuclear explosions, including low yield explosions (1–5 kt). The

Conference has therefore come to the conclusion that it is technically feasible to establish with the capabilities and limitations indicated below, a workable and effective control system to detect violations of an agreement on the worldwide suspension of nuclear weapons tests.

The Conference of Experts has come to the following conclusions regarding such a system:

1. The control system should be under the direction of an international control organ which would ensure the coordination of the activities of the control system in such a way that the system would satisfy the following technical requirements and perform the functions involved:

(*a*) The development, testing, and acceptance of the measuring apparatus and of the equipment, and stating the criteria for the siting, of the control posts;

(*b*) Carrying out at the control posts and on aircraft, mentioned in items 3 and 5 of the present Conclusions, of continuous and effective observations for the phenomena which make it possible to detect nuclear explosions by the use of the methods recommended by the Conference;

(*c*) Reliable communication, with the aid of existing channels where they are suitable for this purpose, between the international control organ on the one hand and, on the other hand, the control posts and the bases from which the regular aircraft flights are carried out; communications and transportation should ensure the speedy transmission of the results of observations, of data (including samples), of reports, and of necessary supplies;

(*d*) Means of transport of personnel of the control posts in accordance with their duties and, so far as necessary, for the staff of the international control organ;

(*e*) Timely analysis and processing of the data from the observations of the control posts with the aim of speedily indentifying events which could be suspected of being nuclear explosions, and in order to be able to report thereon in such manner as is considered by governments to be appropriate;

(*f*) Timely inspection of unidentified events which could be suspected of being nuclear explosions, in accordance with item 6 of the present Conclusions;

(*g*) Staffing of the control system (the network of control posts on land, on ships, and on aircraft, and also the staff of the international control organ) with qualified personnel having appropriate fields of specialization;

(*h*) Providing assistance in putting into effect a scientific research program, with the aim of rasing the scientific standard of the system.

2. A network of control posts is characterized by three main parameters:

(*a*) The minimum yield adopted for the nuclear explosion or the natural events giving equivalent signals;

(*b*) The number of control posts;

(*c*) The probability of correct identification of natural events, particularly earthquakes.

The dependence between these parameters is such that with an increase in the yield of the explosion or the number of control posts the probability of detection and identification increases, and the number of unidentified events suspected of being a nuclear explosion decreases. On the other hand, for the identification of the increased number of unidentified events resulting from a smaller number of control posts it would be necessary to increase the number of on-site inspections or to make greater use of information coming from sources not subordinate to the international control organ or, if necessary, both.

The Conference considers that the problem of detecting and identifying underground explosions is one of the most difficult, and that, to a large extent, it determines the characteristics of the network of control posts.

3. The network of control posts would include from 160 to 170 land-based control posts (equipped in accordance with Section III of this report) and about 10 ships. Of these 160–170 control posts about 100–110 would be situated in continents, 20 on large oceanic islands, and 40 on small oceanic islands; however, the exact number of control posts within the limits indicated above, can be determined only in the process of actually disposing them around the globe, taking into account the presence of noise at the sites at which they are located, and other circumstances.

The spacing between the control posts in continental aseismic areas would be about 1,700 kilometers, and in seismic areas about 1,000 kilometers. The spacing between the control posts in ocean areas would vary between 2,000 and more than 3,500 kilometers; the spacing between island control posts in seismic areas would be about 1,000 kilometers. This would lead to the following approximate distribution of control posts over the globe (with a network including 110 continental posts): North America, 24; Europe, 6; Asia, 37; Australia, 7; South America, 16;

Africa, 16; Antarctica, 4; together with 60 control posts on islands and about 10 ships.

4. The tasks of the personnel of the control posts would include the ensuring of the normal functioning of apparatus, the preliminary processing of data received, and the forwarding of these data to the international control organ and to the government of the country on whose territory the control post is located in such a manner as may be considered appropriate by governments.

In order to carry out the tasks required one might need for each control post about 30 persons with various qualifications and fields of specialization, and also some persons for the auxiliary servicing staff.

5. In addition to the basic network described, air sampling would be accomplished by aircraft carrying out regular flights along north-south routes over the oceans along the peripheries of the Atlantic and Pacific Oceans, and also over areas of the oceans which are remote from surface control posts.

When it is necessary to investigate whether a radioactive cloud is present, in the case of detection of an unidentified event which could be suspected of being a nuclear explosion, special aircraft flights would be organized in order to collect samples of radioactive debris in accordance with Section II–B–10.

6. When the control posts detect an event which cannot be identified by the international control organ and which could be suspected of being a nuclear explosion, the international control organ can send an inspection group to the site of this event in order to determine whether a nuclear explosion had taken place or not. The group would be provided with equipment and apparatus appropriate to its task in each case. The inspection group would forward a report on the investigation it had carried out to the international control organ, and to the government of the country on the territory of which the investigation was made in such a manner as may be considered appropriate by governments.

7. The network of control posts disposed as described, together with the use of aircraft as described, would have the following effectiveness, subject to the qualifications discussed in items 8 and 9:

(*a*) Good probability of detecting and identifying nuclear explosions of yields down to about 1 kiloton, taking place on the surface of the earth and up to 10 kilometers altitude, and good probability of detecting, but not always of identifying, explosions taking place at altitudes from 10 to 50 kilometers. In these cases the independent methods enumerated in Sections II–A, II–B, and II–D would be used.

(*b*) Good probability of detecting nuclear explosions of 1 kiloton yield set off deep in the open ocean. In this case use would be made of the independent hydroacoustic and seismic methods described in Sections II–A and II–C.

The identification of underwater explosions can, in comparatively rare cases, be made more difficult by natural events which give similar hydroacoustic and seismic signals.

(*c*) Good probability of recording seismic signals from deep underground nuclear explosions in continents equivalent to 1 kiloton and above. In this case use would be made of the seismic method described in Section II–C.

The problem of identifying deep underground explosions is considered in item 8.

8. Along with the observation of signals of possible underground explosions the control posts would record at the same time a considerable number of similar signals from natural earthquakes. Although, with the present state of knowledge and techniques, the network of control posts would be unable to distinguish the signals from underground explosions from those of some earthquakes, it could identify as being of natural origin about 90 percent of the continental earthquakes, whose signals are equivalent to 5 kiloton, and a small percentage of continental earthquakes equivalent to 1 kiloton.*

It has been estimated on the basis of existing data that the number of earthquakes which would be undistinguishable on the basis of their seismic signals from deep underground nuclear explosions of about 5 kiloton yield could be in continental areas from 20 to 100 a year. Those unidentified events which could be suspected of being nuclear explosions would be inspected as described in item 6.

The capability of the control system to identify underground nuclear explosions of 1–5 kiloton yield depends on—

(*a*) The small fraction of earthquakes that can be identified on the basis of data obtained from the control posts alone;

*The Conference notes that in order to increase the percentage of earthquakes of less than 5 kiloton yield which could be identified, it would be appropriate to supplement the data from the control posts by trustworthy data from the best existing seismic stations. The results of the observations of these seismic stations should, for this purpose, be made available to the international control organ, and the equipment of the seismic stations suitable for this purpose could be improved by using the best modern apparatus.

(*b*) The fraction of earthquakes that can be identified with the aid of supplementary data obtained from existing seismic stations; and

(*c*) The fraction of events still left unidentified which could be suspected of being nuclear explosions and for which the international control organ carries out inspection in accordance with item 6.

Although the control system would have great difficulty in obtaining positive identification of a carefully concealed deep underground nuclear explosion, there would always be a possibility of detection of such a violation by inspection.

The on-site inspection carried out by the international control organ in accordance with item 6 would be able to identify with good probability underwater nuclear explosions with a yield of 1 kiloton and above.

9. The Conference notes that in certain special cases the capability of detecting nuclear explosions would be reduced; for instance, when explosions are set off in those areas of the ocean where the number of control posts is small and the meteorological conditions are unfavorable; in the case of shallow underground explosions; when explosions are set off on islands in seismic regions; and in some other cases when the explosion is carefully concealed. In some cases it would be impossible to determine exactly the area in which a nuclear explosion that had been detected took place.

However, the Conference considers that whatever the precautionary measures adopted by a violator he could not be guaranteed against exposure, particularly if account is taken of the carrying out of inspection at the site of the suspected explosion.

10. The system described does not include specific means to detect and identify nuclear explosions at high altitudes (above 30–50 kilometers). The Conference has formulated its findings on the methods of detecting nuclear explosions set off at altitudes greater than 30–50 kilometers and has characterized these methods in Section II–E.

11. The Conference of Experts recommends the control system described above for consideration by governments.

The following experts participated as delegates at the Conference:

Western Experts

Dr. James B. Fisk
Dr. Robert F. Bacher
Sir John Cockcroft
Dr. Ernest O. Lawrence
Sir William Pennoy
Prof. Yves André Rocard
Dr. O. M. Solandt

Delegations of
Union of Soviet Socialist Republics

E. K. Fedorov
N. N. Semenov
I. E. Tamm
M. A. Sadovski
O. I. Leipunski
I. P. Pasechnik
K. E. Gubkin
S. K. Tsarapkin

Polish People's Republic

M. Miesowicz
L. Jurkiewicz
M. Blusztajn

Czechoslovak Republic

Č. Simáně
F. Běhounek
A. Zátopek
Z. Trhlik

People's Republic of Romania

H. Hulubei

(Annexes omitted.)

✖